بسم الله الرحمن الرحيم

جامعة الملك خالد

كلية الهندسة

قسم الهندسة الميكانيكية

ملخص

الخطة الدراسية

لبرنامج بكالوريوس العلوم في الهندسة الميكانيكية

1440-1439

ملخص الخطة الدراسية

لبرنامج بكالوريوس العلوم في الهندسة الميكانيكية

يعتبر قسم الهندسة الميكانيكية من الأقسام الأولى التى تم إنشاؤها فى كلية الهندسة منذ بدء إنشاء الجامعة وذلك فى الفصل الدراسي الأول للعام الجامعي 1423/1422 هـ. ومنذ انشاء القسم يسعى دائما إلى التميز وذلك بالتطوير الدائم للخطط الدراسية لمواكبة التطورات الحديثة في مجال الهندسة الميكانيكية. وفي خلال تلك الفترة قدم القسم خمس إصدارات مختلفة للخطة الدراسية آخرها الإصدار الذي حصل على الاعتماد الدولي ABET في سبتمبر 2017 في إنجازغير مسبوق بالجامعة وكذلك التقدم للاعتماد الاكاديمي المحلي NCAAA والمتوقع الحصول عليه هذا العام 2018.

ومواكبة لأحدث التطورات في مجال الهندسة الميكانيكية يقدم القسم الخطة الدراسية الجديدة لبرنامج بكالوريوس الهندسة الميكانيكية والتي تتكون من **160 ساعة معتمدة موزعة على عشر فصول دراسية** تغطي كافة متطلبات الجامعة **(12 ساعة معتمدة)** والكلية **(56 ساعة معتمدة)** والقسم **(73 ساعة معتمدة)** وتغطي كافة المهارات المطلوبة لإعداد خريج متميز ومؤهل بالمهارات والمعلومات في مجال الهندسة الميكانيكية بمساريها (هندسة الطاقة وهندسة الانتاج والتصميم) والتي تجعله قادرا على تنمية وتطوير المجتمع وتنفيذ خطط التطور الطموحة للمملكة. و كذلك تقدم الخطة مقررات حرة **(5 ساعات معتمدة)** ومقررات اختيارية تخصصية **(14 ساعة معتمدة)** والتي من خلالها يتم تصنيف توجه الطالب إلي مسار هندسة الطاقة أوهندسة الإنتاج والتصميم . وخلال إعداد الخطة تم مراعاة الآتي:

1- مواكبة رؤية 2030 للمملكة والتي تستهدف بناء منظومة تعليمية مرتبطة باحتياجات سوق العمل والسعي إلى سد الفجوة بين مخرجات التعليم العالي ومتطلبات سوق العمل وذلك من خلال تقديم مقررات بالخطة الدراسية المقترحة تقدم مخرجات تعليمية ومهارات تحقق أهداف ورؤية 2030.
2- الاتساق الكامل لمخرجات التعلم بالخطة الدراسية مع مخرجات التعلم بالاطار الوطني للمؤهلات NQF
3- كافة متطلبات الاعتماد الدولي ABET والاعتماد الأكاديمي المحلي NCAAA
4- مطابقة مخرجات التعلم والمهارات التي تقدمها الخطة مع المهارات التي يتم قياسها في المركز الوطني للقياس وكذلك المخرجات والمهارات المطلوبة للهيئة السعودية للمهندسين. وتشمل هذه المهارات المعارف والمهارات الإدراكية المطلوبة لتخصص الهندسة الميكانيكية بمساريه بالاضافة إلي المهارات الآتية:

- مهارات التواصل ، وتقنية المعلومات، والمهارات الحسابية (العددية):
- مهارات العلاقات مع الآخرين والمسئولية.

- مهارات حل المشاكل.
- مهارات التعلم المستمر وتحسين الأداء.

جدول الخطة الدراسية

رمز المقرر	اسم المقرر	الساعات المعتمدة				متطلب سابق (إن وجد)	المتطلب المتزامن (إن وجد)
		نظري	عملي	مجموع	اتصال		
السنة الأولى - المستوى الأول							
011-نجل-6	برنامج اللغة الانجليزية المكثف -1	-	6	6	12	--	--
107-كيم-4	كيمياء عامة	3	1	4	5	--	--
119-ريض-3	تفاضل وتكامل-1	3	-	3	3	--	--
111-سلم-2	المدخل الى الثقافة الاسلامية	2	-	2	2	--	--
201-عرب-2	المهارات اللغوية	2	-	2	2	--	--
	المجموع	10	7	17	24		
السنة الأولى - المستوى الثاني							
012-نجل-6	برنامج اللغة الانجليزية المكثف -2	-	6	6	12	011-نجل-6	--
104-حال-2	علوم الحاسب	1	1	2	3	--	--
219-ريض-3	تفاضل وتكامل-2	3	-	3	3	119-ريض-3	--
129-فيز-4	فيزياء -1	3	1	4	5	--	--
112-سلم-2	الثقافة الاسلامية -2	2	-	2	2	--	--
	المجموع	9	8	17	25		
السنة الثانية - المستوى الثالث							
111-هعم-3	رسم هندسي	-	3	3	6	--	--
211-همك-3	علم المواد	2	1	3	4	129-فيز-4 107-كيم-4	--
212-همك-2	ميكانيكا هندسية (استاتيكا)	2	-	2	2	--	--
211-هعم-2	مهارات تعلم	2	-	2	2	--	--
219-فيز-4	فيزياء -2	3	1	4	5	129-فيز-4	--
229-ريض-3	تفاضل وتكامل-3	3	-	3	3	219-ريض-3	--
	المجموع	12	5	17	22		
السنة الثانية - المستوى الرابع							
221-همك- 3	تكنولوجيا الإنتاج والورش	1	2	3	5	111-هعم-3	--
222-همك-3	ديناميكا حرارية -1	2	1	3	4	129-فيز-4 119-ريض-3	--
223-همك-3	مقاومة المواد واختباراتها	2	1	3	4	211-همك-3	--
221-هعم-2	الإبداع والابتكار	2	-	2	2	--	--
202-عرب-2	التحرير العربي	2	-	2	2	--	--

222-هعم-2	برمجة هندسية	1	1	2	3	104-حال-2	--
319-ريض-3	معادلات تفاضلية	3	-	3	3	219 -ريض-3	--
	المجموع	13	5	18	23		
السنة الثالثة - المستوى الخامس							
311-همك-3	عمليات قطع المعادن	2	1	3	4	211-همك-3 221-همك-3	--
312-همك-3	رسم ميكانيكي	1	2	3	5	111-هعم-3	--
313-همك-2	ميكانيكا هندسية (ديناميكا)	2	-	2	2	--	--
218-كهر-3	هندسة كهربائية -1	2	1	3	4	129-فيز-4 119-ريض-3	--
113-سلم-2	الثقافة الاسلامية -3	2	-	2	2	--	--
329-ريض-3	الجبر الخطي	3	-	3	3	--	--
301-نجل-2	كتابة التقارير الفنية	2	-	2	2	012-نجل-6	--
	المجموع	14	4	18	22		
السنة الثالثة - المستوى السادس							
321-همك-3	نظرية آلات	2	1	3	4	212-همك-2 313-همك-2	--
322-همك-3	ميكانيكا الموائع	2	1	3	4	222-همك-3	--
328-كهر-3	هندسة كهربائية -2	2	1	3	4	218-كهر-3	--
419 -ريض-3	طرق عددية	3	-	3	3	319-ريض-3	--
329-إحص-2	مبادئ الإحصاء والاحتمالات	2	-	2	2	--	--
114-سلم-2	الثقافة الاسلامية -4	2	-	2	2	--	--
	المجموع	13	3	16	19		
التدريب الصيفي							
400-همك-0	التدريب الصيفي	0	0	0	0	اجتياز 95 ساعة معتمدة	--
السنة الرابعة - المستوى السابع							
411-همك-3	تصميم أجزاء ماكينات -1	2	1	3	4	223-همك-3 312-همك-3	--
412-همك-3	عمليات تشكيل معادن	2	1	3	4	211-همك-3 221-همك-3	--
413-همك-3	انتقال الحرارة	2	1	3	4	322-همك-3	--
414-همك-2	أجهزة قياس	1	1	2	3	321-همك-3	--
411-هعم-2	اخلاقيات و ممارسة المهنة	2	-	2	2	--	--
xxx	مقرر حر -1	3	-	3	3	--	--
	المجموع	12	4	16	20		

السنة الرابعة - المستوى الثامن							
421-همك-3	تصميم الات	2	1	3	4	411-همك-3	--
422-همك-3	ديناميكا حرارية-2	2	1	3	4	222-همك-3	--
423-همك-3	آلات هيدروليكية وأنظمة طاقة الموائع	2	1	3	4	322-همك-3	--
424-همك-3	ديناميكا النظم والاهتزازات الميكانيكية	2	1	3	4	321-همك-3 319-ريض-3	--
311-هصن-2	الاقتصاد الهندسي	2	-	2	2	--	--
	مقرر اختياري -1	2	-	2	2	--	--
المجموع		12	4	16	20		
السنة الخامسة - المستوى التاسع							
511-همك-3	أنظمة التحكم	2	1	3	4	424-همك-3	--
512-همك-2	مشروع تخرج-1	2	-	2	2	اجتياز 125ساعة معتمدة	--
511-هعم-2	ريادة الاعمال الهندسية	2	-	2	2	--	--
	مقرر اختياري -2			3		--	--
	مقرر اختياري -3			3		--	--
xxx	مقرر حر-2	2	-	2	2	--	--
المجموع				15			
السنة الخامسة - المستوى العاشر							
521-همك-2	مشروع تخرج-2	2	-	2	2	512-همك-2	--
411-هصن-2	الادارة الهندسية	2	-	2	2	--	--
	مقرر اختياري -4			3		--	--
	مقرر اختياري -5			3		--	--
المجموع				10			

المقررات الاختيارية

يتم اختيار المقررات الاختيارية (2) و (3) و(4) و (5) طبقا للاتي :

1- **الطالب الراغب في مسار هندسة القوى :** يختار مقررات هندسة القوى فقط من قائمة المقررات الاختيارية
2- **الطالب الراغب في مسار هندسة التصميم والانتاج:** يختار مقررات هندسة التصميم والانتاج فقط من قائمة المقررات الاختيارية
3- **الطالب الراغب في مسار عام :** يختار المقررات الاختيارية دون التقيد بأي مسار

قائمة مقرر اختياري -1

رمز المقرر	اسم المقرر	الساعات المعتمدة				متطلب سابق (إن وجد)	المتطلب المتزامن (إن وجد)
		نظري	عملي	مجموع	اتصال		
321-هعم-2	إدارة المعرفة	2	-	2	2	--	--
322-هعم-2	التفكير التصميمي	2	-	2	2	--	--
323-هعم-2	ديناميكا النظم	2	-	2	2	--	--

قائمة المقررات الاختيارية 2 و 3 و 4 و 5

المسار	رمز المقرر	اسم المقرر	الساعات المعتمدة				متطلب سابق (إن وجد)	المتطلب المتزامن (إن وجد)
			نظري	عملي	مجموع	اتصال		
هندسة القوى	531-همك-3	محركات الاحتراق الداخلي	2	1	3	4	413-همك-3	--
	532-همك-3	تحويل الطاقة	3	-	3	3	422-همك-3	--
	533-همك-3	محطات الطاقة	2	1	3	4	413-همك-3	--
	541همك-3	المباني الموفرة للطاقة	3	-	3	3	413-همك-3	--
	542همك-3	تحلية المياه	3	-	3	3	422-همك-3	--
	543همك-3	التبريد وتكييف الهواء	2	1	3	4	413-همك-3	--
هندسة التصميم والانتاج	534-همك-3	التصنيع بمساعدة الحاسب	2	1	3	4	311-همك-3	--
	535-همك-3	السلوك الميكانيكي للمواد	2	1	3	4	211-همك-3	--
	536-همك-3	مواد مركبة	3	-	3	3	211-همك-3	--
	544همك-3	أساسيات المعالجة الحرارية	2	1	3	4	211-همك-3	--
	545همك-3	تحليل العناصر المحدودة في التصميم الميكانيكي	1	2	3	5	421-همك-3 419-ريض-3	--
	546همك-3	تكنولوجيا النانو	3	-	3	3	211-همك-3	--

Distribution of courses over the different levels

Course Code	Course Title	Weekly Distribution of Credit Hours				Prerequisites
		Lectures	Lab	Credit Hours	Contact Hour	
First Year - First Level						
011-ENG-6	Intensive English Program-1	-	6	6	12	--
107-CHEM- 4	General Chemistry	3	1	4	5	--
119-MATH-3	Differentiation and Integration-1	3	-	3	3	--
111-ICl-2	The Entrance to the Islamic Culture	2	-	2	2	--
201-ARAB-2	Language Skills	2	-	2	2	--
Total Number of Hours		**10**	**7**	**24**	**17**	
First Year – Second Level						
012-ENG-6	Intensive English Program-2	-	6	6	12	011-ENG-6
104-CMS-2	Computer Science	1	1	2	3	--
219-MATH-3	Differentiation and Integration-2	3	-	3	3	119-MATH-3
129-PHYS-4	Physics-1	3	1	4	5	--
112-IC1-2	Islamic Culture-2	2	-	2	2	--
Total Number of Hours		**9**	**8**	**17**	**25**	
Second Year – Third Level						
111-GE-3	Engineering Drawing	-	3	3	6	--
211-ME-3	Material Science	2	1	3	4	129-PHYS-4 107-CHEM- 4
212-ME-2	Engineering Mechanics (statics)	2	-	2	2	--
211-GE-2	Learning skills	2	-	2	2	--
219-PHYS-4	Physics-2	3	1	4	5	129-PHYS-4
229-MATH- 3	Differentiation and Integration-3	3	-	3	3	219-MATH-3
Total Number of Hours		**12**	**5**	**17**	**22**	
Second Year – Fourth Level						
221-ME-3	Production Technology and Workshop	1	2	3	5	111-GE-3
222-ME-3	Thermodynamics-1	2	1	3	4	129-PHYS-4 119-MATH-3
223-ME-3	Strength of Materials & Testing	2	1	3	4	211-ME-3
221-GE-2	Creativity and Innovation	2	-	2	2	--

202-ARAB- 2	Arabic Writing	2	-	2	2	--
222-GE-2	Engineering Programming	1	1	2	3	104-CMS-2
319-MATH- 3	Differential Equations	3	-	3	3	219-MATH-3
Total Number of Hours		**13**	**5**	**18**	**23**	
Third Year – Fifth Level						
311-ME-3	Metal Cutting Processes	2	1	3	4	211-ME-3 221-ME-3
312-ME-3	Mechanical Engineering Drawing	1	2	3	5	111-GE-3
313-ME-2	Engineering Mechanics (dynamics)	2	-	2	2	--
218-EE-3	Electric Engineering-1	2	1	3	4	129-PHYS-4 119-MATH-3
113-IC1-2	Islamic Culture-3	2	-	2	2	--
329-MATH- 3	Linear Algebra	3	-	3	3	--
301-NGL-2	Technical Reports Writing	2	-	2	2	012-ENG-6
Total Number of Hours		**14**	**4**	**18**	**22**	
Third Year – Sixth Level						
321-ME-3	Theory of Machines	2	1	3	4	212-ME-2 313-ME-2
322-ME-3	Fluid Mechanics	2	1	3	4	222-ME-3
328-EE-3	Electric Engineering-2	2	1	3	4	218-EE-3
419-MATH-3	Numerical Methods	3	-	3	3	319-MATH- 3
329-STAT-2	Principles of Statistics and Probability	2	-	2	2	--
114-IC1-2	Islamic Culture-4	2	-	2	2	--
Total Number of Hours		**13**	**3**	**16**	**19**	
Summer Internship						
400-ME-0	Summer Internship	0	0	0	0	Completion of 95 credit hours
Fourth Year–Seventh Level						
411-ME-3	Machine Elements Design-1	2	1	3	4	223-ME-3 312-ME-3
412-ME-3	Metal Forming Processes	2	1	3	4	211-ME-3 221-ME-3
413-ME-3	Heat Transfer	2	1	3	4	322-ME-3
414-ME-2	Measuring Devices	1	1	2	3	321-ME-3
411-GE-2	Professional Ethics and practice	2	-	2	2	--
xxx	Free course- 1	3	-	3	3	--
Total Number of Hours		**12**	**4**	**16**	**20**	
Fourth Year– Eighth Level						
421-ME-3	Machine Design	2	1	3	4	411-ME-3
422-ME-3	Thermodynamics-2	2	1	3	4	222-ME-3
423-ME-3	Hydraulic Machines & Fluid Power Systems	2	1	3	4	322-ME-3

424-ME-3	System Dynamics & Mechanical Vibrations	2	1	3	4	321-ME-3 319-MATH- 3
311-INE-2	Engineering Economy	2	-	2	2	--
	Elective-1	2	-	2	2	--
Total Number of Hours		**12**	**4**	**16**	**20**	
Fifth Year–Ninth Level						
511-ME-3	Control Systems	2	1	3	4	424-ME-3
512-ME-2	Senior Design Project-1	2	-	2	2	Completion of 125 credit hours
511-GE-2	Engineering Entrepreneurship	2	-	2	2	--
	Elective -2			3		--
	Elective -3			3		--
xxx	Free course-2	2	-	2	2	--
Total Number of Hours				**15**		
Fifth Year–Tenth Level						
521-ME-2	Senior Design Project-2	2	-	2	2	512-ME-2
411-INE-2	Engineering Managements	2	-	2	2	
	Elective-4			3		
	Elective-5			3		
Total Number of Hours				**10**		

Elective courses

Elective courses (2), (3), (4) and (5) are selected according to the following:

1 - **Students interested in power engineering path**: choose the courses of power engineering path only from the list of elective courses

2 - **Students interested in engineering design and production path**: Choose the courses of engineering design and production path only from the list of elective courses

3 - **Students interested in general path**: choose elective courses without follow any path

List of Elective course -1

Course Code	Course Title	Weekly Distribution of Credit Hours				Prerequisites
		Lectures	Lab	Credit Hours	Contact Hour	
First Year - First Level						
321 GE-2	Knowledge Management	2	-	2	2	--
322 GE-2	Design Thinking	2	-	2	2	--
323 GE-2	System Dynamics	2	-	2	2	--

List of Elective courses (2), (3), (4) and (5)

Path	Course Code	Course Title	Weekly Distribution of Credit Hours				Prerequisites
			Lectures	Lab	Credit Hours	Contact Hour	
Power Engineering	531-ME-3	Internal Combustion Engines	2	1	3	4	413-ME-3
	532-ME-3	Energy Conversion	3	-	3	3	422-ME-3
	533-ME-3	Power Plants	2	1	3	4	413-ME-3
	541-ME-3	Energy Efficient Buildings.	3	-	3	3	413-ME-3
	542-ME-3	Desalination	3	-	3	3	422-ME-3
	543-ME-3	Refrigeration and Air Conditioning	2	1	3	4	413-ME-3
Design and Production Engineering	534-ME-3	Computer Aided Manufacturing	2	1	3	4	311-ME-3
	535-ME-3	Mechanical Behavior of Materials	2	1	3	4	211-ME-3
	536-ME-3	Composite Material	3	-	3	3	211-ME-3
	544-ME-3	Fundamentals of Heat Treatment	2	1	3	4	211-ME-3
	545-ME-3	Finite Element Analysis in Mechanical Design	1	2	3	5	421-ME-3 419-MATH-3

	546-ME-3	Nano technology	3	-	3	3	211-ME-3

Course Syllabi and Description
For
First Year

Level-1		
01	011-ENG-6	Intensive English Program-1
02	107-CHEM- 4	General Chemistry
03	119-MATH-3	Differentiation and Integration-1
04	111-ICl-2	The Entrance to the Islamic Culture
05	201-ARAB-2	Language Skills

Level-2		
06	012-ENG-6	Intensive English Program-2
07	104-CMS-2	Computer Science
08	219-MATH-3	Differentiation and Integration-2
09	129-PHYS-4	Physics-1
10	112-IC1-2	Islamic Culture-2

Course title	Intensive English Program-1	**Coordinator**			
Course code	011-ENG-6	**Credits Hrs**	6	**Contact Hrs**	2
Prerequisites	High School English Pass (grade 10,11,or 12)	**Level/Year**		1/1	

Course Objective:

- To prepare students to communicate in real life situations (professional and social).
- To enhance students' overall proficiency in English.
- To enhance their aural comprehension and oral expression.
- To use the forms and constructions of basic grammatical structures.
- To enable students to write different forms of composition, such as letters, applications, recommendations, paragraphs, e-mails etc.
- To furnish students with reading skills and strategies like previewing; skimming and scanning; reading in detail, finding examples; definitions; using background knowledge to interact with text, using a graphic organizer, organizing events in narrative texts; tables; graphs; charts; info-graphics; reading different texts/graphs from print and electronic medium and on different mediums such as paper, electronics (computer, mobile, iPad and other advance gadgets etc.).

Teaching Method: Classroom

Expected Learning Outcomes

CLO-1. Develop general proficiency in English for beginners in academic and general purposes.
CLO-2. Acquire basic communication skills in academic and general purposes
CLO-3. Acquire basic speaking skills in English for beginners in academic and general purposes.
CLO-4. Acquire basic listening skills in English for beginners in academic and general purposes.
CLO-5. Acquire basic writing skills in English for beginners in academic and general purposes.
CLO-6. Acquire basic grammar structures for beginners in academic and general purposes.
CLO-7. Acquire basic reading skills for beginners in academic and general purposes
CLO-8. Acquire basic English vocabulary for beginners in academic and general purposes.

Course Contents:

Unit I:	Chapter 1 listening skill focus: reflecting on listening Speaking skill focus: asking for help / approved content
	Chapter 2

	Listening skill focus: Activating background knowledge (1) Speaking skill focus: reflecting on speaking / approved content
	Chapter 3 Listening skill focus: activating background knowledge (2) Speaking skill focus: Asking for clarification / approved content
	Chapter 4 Listening skill focus: predicting Speaking skill focus: taking time to think /approved content
Unit II:	Chapter 5 Listening skill focus: listening for main ideas Speaking skill focus: clarifying/ approved content
	Chapter 6 Listening skill focus: working without unknown vocabulary Speaking skill focus: asking for further information/ approved content
Unit III:	Chapter 7 Listening skill focus: identifying speculative language Speaking skill focus: using expression to show interest/ approved content
	Chapter 8 Listening skill focus: listening for specific information Speaking skill focus: elaborating / approved content
	Chapter 9 Listening skill focus: identifying sequencers Speaking skill focus: summarizing/ approved content
Unit IV:	Chapter 11 Listening skill focus: listening for examples Speaking skill focus: giving opinions and responding to opinions / approved content
	Chapter 12 Listening skill focus: identifying important points Speaking skill focus: rephrasing to check understanding / approved content
Text Book (s): • McCarthy, Michael. Touchstone (1) Student's Book. Dubai: Cambridge and Obeikan, 2009 • McCarthy, Michael. Touchstone (1) Work Book. Dubai: Cambridge and Obeikan, 2009 • Blackwell, Angela. Open Forum (1) Academic Listening and Speaking. Oxford: Oxford University Press, 2007.	
Reference Book (s): • Blass, Laurie. Well Read (1). Oxford: Oxford University Press, 2008.	

Mode of Evaluation:

1. Lectures
2. Large-and small-group discussion
3. Homework and assignments.
4. Interacting through E-learning.

Course title	General Chemistry	**Coordinator**			
Course code	107 -Chem-4	**Credits Hrs**	4	**Contact Hrs**	5
Prerequisites	NIL	**Level/Year**		1/1	

Course Objective

This course is a general introduction to chemistry course that incorporates both lectures and laboratory experiments in developing and understanding chemical concepts and practices.

After teaching of that course the students must have the following skills:

- Identification of matters and measurement, properties of substances, significant figures and uncertainty in measurements.
- Identification of atoms and atomic structure and electronic configuration.
- Identification of Mass relations in Chemistry, molecular mass, simplest formula, molecular formula, structural formula, mass relation in reactions
- Identification of Gases, Ideal gases, Gas law, Avogadro's low, Dalton's Law of Partial Pressure, Kinetic Theory of Gases,
- Identification of Liquids, Solids and Intermolecular Forces, Equilibria between phases and Properties of Liquids
- Acquiring knowledge about Electronic Structure of Atoms, Electromagnetic Radiation, The Quantum Theory, The Bohr's Theory, The Modern Theory of Atomic Structure, Electronic Configuration, Ionization Energy
- Identification of Covalent bonding, Lewis structures, octet rule, molecular geometry.
- Weekly laboratory experiments emphasize quantitative techniques and complement the lecture material.

Teaching Method

Using different strategic teaching (white board and power point presentation)

Expected Learning Outcomes:

CLO-1. Identification of matters and measurement, properties of substances, significant figures and uncertainty in measurements.
CLO-2. Identification of atoms and atomic structure and electronic configuration.
CLO-3. Identification of Mass relations in Chemistry, molecular mass, simplest formula, molecular formula, structural formula, mass relation in reactions.
CLO-4. Identification of Gases, Ideal gases, Gas law, Avogadro,s low, Dalton's Law of Partial Pressure, Kinetic Theory of Gases

CLO-5. Identification of Liquids, Solids and Intermolecular Forces, Equilibria between phases and Properties of Liquids. CLO-6. Acquiring knowledge about Electronic Structure of Atoms, Electromagnetic Radiation, The Quantum Theory, The Bohr's Theory, The Modem Theory of Atomic Structure, Electronic Configuration, and Ionization Energy. CLO-7. Identification of Covalent bonding, Lewis structures, octet rule, molecular geometry. CLO-8. Identification the matter, types of matter, atomic structure, and organic compounds. CLO-9. Self-teaching for the students, Research on the internet CLO-10. Using the computer, Practical skills	
Course Contents:	
Unit I:	Matter - Its Properties and Measurements: Types of Matter, Quantities and SI-units, Uncertainty and Significant Figures.
Unit II:	Atoms and the atomic theory, Dalton's theory, Modem view of atomic structure, Isotopes, Introduction to the periodic table, Molecular Formula, Empirical or Simplest Formula, Structural Formula, Formula of ionic compounds.
Unit III:	Mass Relations in Chemistry: Mole, Molecular Mass,_ Simplest Formula from Chemical analysis, Molecular Formula from Simplest Formula and Mass Relations in Reactions.
Unit IV:	Gases: Properties of Gases, The Simple Gas Laws, The Ideal Gas Equation and The General Gas Equation, Mixtures of Gases, Dalton's Law of Partial Pressure, Graham's Law, Real Gas and van der Waals Equation.
Unit V:	Liquids, Solids and Intermolecular Forces: Properties of Liquids, Vaporization of Liquids, Vapor Pressure, Some Properties of Solids, Phase Diagrams, Van der Waals Forces, Hydrogen Bonding, Chemical Bonds as Intermolecular Forces.
Unit VI:	Electronic Structure of Atoms: Electromagnetic Radiation, The Quantum Theory, Bohr's Theory, De-Broglie Principal, The Modern Theory of Atomic Structure, Pauli Exclusion Principle, Hund's Rule, Electronic Configuration, Isoelectronic, Trends in the Properties of Atoms in Periodic Table, Atomic Radius, Ionic Radius of ions, Ionization Energy, Electronegativity. Covalent bonding, Lewis structures, octet rule, molecular geometry.
Unit VII:	List of topics (Practical): • Identification the safety rules in laboratory, Determination the density of liquid and solid substances, Determination the viscosity of organic liquid, Identification the acidic radicals of the salts, Identification the

	basic radicals of the salts, Scheme for identification the acidic and basic radicals of the salts, Preparation of sodium carbonate (Na_2CO_3) and sodium bicarbonate ($NaHCO_3$) solutions, Separation of a mixture containing NaCl, SiO_2, and $(NH4)_2CO_3$, Separation of a mixture containing NaCl, SiO_2, and $(NH4)_2CO_3$, Determination the value of general gas constant (R), Determination the molecular weight of volatile liquid

Text Book (s):

- Ralph H. Petrucci, William S. Harwood, and F. Geoffrey Herring, "General Chemistry, Principles and Modern Applications", 10th Edition, Prentice Hall, 2009.

Reference Book (s):

- Catherine E. Housecroft, Edwin C. Constable, "Chemistry: An Introduction to Organic, Inorganic and Physical Chemistry", 3rd Ed., Pearson Education Limited, 2006.
- Theodore L. Brown, H. Eugene LeMay, Jr, Bruce E. Bursten, "Chemistry: The Central Science", 10th Ed., Pearson Education, Inc., 2006

Mode of Evaluation:

- Assignments……(5%)
- Midterm Test-1 ……(10%)
- Midterm Test-2 ……(10%)
- Practical tests……(25%)
- Final exam……(50%)

Course title	Differentiation & Integration -1	**Coordinator**			
Course code	119- Math-3	**Credits Hrs**	3	**Contact Hrs**	3
Prerequisites	NIL	**Level/Year**		1/1	

Course Objective

The main tool in this program is to familiarize the student with some techniques of calculus concerning the inequalities, the equations, the lines, the circles and the functions. For the last notion, we introduce definition and techniques of limits, continuity, differentiability and some analysis results.

Teaching Method

- Lectures, Class discussion,
- Visual presentation, Tutorial
- (video + practical)

Expected Learning Outcomes:

CLO-1. To familiarize the student with the techniques of calculus
CLO-2. To manipulate the basic results of functions and some standard theorem as Rolle's Theorem and mean value theorem
CLO-3. To use the techniques and theorems in the area of specialty and in the all field where it is possible
CLO-4. To develop the spirit of analysis and logic. To develop skills of research
CLO-5. Work independently and as part of a team.
CLO-6. Manage resources, time and other members of the group, Communicate results of work to others
CLO-7. How to improve their language and writing skills
CLO-8. Use computational tools, Student should manipulate all the mathematical knowledge in real-life problems, Capacity to present and discuss mathematical ideas and to acquire mathematical proof skills.

Course Contents:

Unit I:	Equations, Inequalities, factorisation and quadratic formula and revision of some basic skills of mathematics.
Unit II:	Definition of functions, domain, range, symmetry, and graph of some kinds of functions, transformations, Addition, subtraction, multiplication and division, and their domain
Unit III:	Trigonometric functions and some properties and identities.

Unit IV:	Definition of limits, techniques of finding limits and sandwich theorem
Unit V:	Continuity, discontinuity
Unit VI:	Definition of derivatives, basic rules of differentiation, techniques of derivatives, limits and derivatives of trigonometric functions, the chain rules, implicit differentiation and applications of derivation in finding the equation of tangent lines
Unit VII:	Rolle's theorem, mean value theorem, extremum, first and second derivative tests, asymptotes and graph of functions
Text Book (s):	
Reference Book (s): • Swokourki, M.Olinich, D.Pena, J.A.Cole, Calculus. Pws pub. Co. ,1994	
Mode of Evaluation: • Quizzes……(10%) • Midterm-1 ……(20%) • Midterm-2 ……(20%) • Final exam……(50%)	

Course title	The Entrance to the Islamic Culture -I	**Coordinator**			
Course code	111IC1-2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites		**Level/Year**		1/1	

Course Objective

After the completion of this course, it is expected that the students can:

- Entrench correct doctrine derived from the Quran and Sunnah in the hearts of students.
- Understand the assets of Six faith.
- Realize what is contrary to faith or perfection.

Teaching Method

Expected Learning Outcomes:

Course Contents:

Unit I:	The definition of culture and characteristics, and clarify the meaning of faith, and the call to faith, and faith assets.
Unit II:	Deism and the unification of divinity and their meaning and their relationship.
Unit III:	Methods of the Koran in calling for the unification of divinity, and photos of polytheism and dangerous
Unit IV:	Belief in the Angels and the position of the Koran and books of the previous books Belief in the Messengers The definition of heresy and kinds
Unit V:	
Unit VI:	
Unit VII:	

Text Book (s):

- Book guidance to the true belief and the response to the atheism -Dr.alfozan

Reference Book (s):

- Profiles in Islamic culture-Omar Khatib
- Unification-Mohammed Abdel Wahab
- The religion- Mohammed Draz

Mode of Evaluation:

- Mid-Term Test-1 ..... (25 %)
- Mid-Term Test-2 ..... (25 %)
- Final Exam .....(50 %)

Course title	Language Skills	**Coordinator**			
Course code	201ARAB-2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites	-	**Level/Year**		1/1	

Course Objective

This course is

- For the development of Students Positive attitude towards the language regarding, reading, writing, and Performance & the correctness of linguistic expression and avoiding error
- To provide the student with a glance at the language and its figure and the history of Arabic arts

Teaching Method:

- Lectures & E Learning classes
- Dialogues and Discussion
- Self-Learning

Expected Learning Outcomes:

CLO-1. To identify the types of words
CLO-2. To know the sign of each type of words
CLO-3. To differentiate noun, verb and particle
CLO-4. To be acquainted with how to parse

Course Contents:

Unit 1: Introduction to Linguistic Skill + Types of words	Introduce student to the course, its main goal and included scientific topics Noun makers, Verb Makers etc
Unit II : Parsing of Noun and Verbs	Apparent and non-Apparent parsing of Nouns Apparent and non-Apparent parsing of Verbs Major Parsing Sign of movement Secondary Parsing Sign of movement

Unit III: Suffixation I	Plural Masculine and Plural Feminine
Unit IV: Suffixation II	Six Nouns
Unit V: Case Ending	Nouns Regularities
Unit VI: Semantics	Generalization and Specialization of words Indication of Nouns and Verbs
Unit VII: Some Arab Figures	Khalid bin Ahmed Fareehidi Sibawayh

Text Book (s):

- The concise of Arabic language grammer, Said AlAfghani ,Mustafa Ameen
- The philology and Arabic properties, Mohammad Almubarak
- The obvious syntax of Arabic Grammer

Reference Book (s):

- The Arabic Dictionary, D Raid Zaki Qasim
- The classical councils for Arabic language science and Arts

Mode of Evaluation:

- Mid-Term Test-1 …… (15 %)
- Mid-Term Test-2 …… (10 %)
- Assignments …… (25 %)
- Final Exam. …… (50 %)

Course title	Intensive English Program-2	**Coordinator**			
Course code	012-ENG-6	**Credits Hrs**	**6**	**Contact Hrs**	
Prerequisites	011-ENG-6	**Level/Year**		2/1	

Course Objective

- To prepare students to communicate in real life situations.
- To enhance students' proficiency level in English.
- To enhance their aural comprehension and oral expression.
- To use the forms and constructions of basic grammatical structures.
- To enable students to write different forms of composition, such as letters, recommendations, paragraphs, e-mails etc.
- To furnish students with reading skills like previewing; skimming and scanning; finding examples; using background knowledge to interact with a text; using a graphic organizer; organizing events in narrative texts; reading tables; and improving reading speed.

Teaching Method

- Classroom

Expected Learning Outcomes

CLO-1. Developing the students' academic writing skills
CLO-2. Developing the students' academic critical reading skills
CLO-3. Enhancing students' team work skills by doing research tasks in groups or pairs
CLO-4. Raising students' awareness of the importance of original work and avoiding plagiarism
CLO-5. Developing students' skill of searching relevant online material
CLO-6. Selection of community problems as research topics.

Course Contents:

Unit I:	Skill:- Listening & Speaking Book: Open forum II Angela Blackwell and Therese Naber, Oxford University Press, 2006
	Environmental studies Topic-City Planning Listening skill focus: Activating background knowledge Speaking skill focus: Reflecting on listening.
Unit II:	Psychology Topic-Leisure activities; quality of Life Listening skill focus: Reflecting on listening

	Speaking skill focus: Elaborating to keep a conversation going.
Unit III:	Food Science Topic- Food; Changes in habits Listening skill focus: Predicting Speaking skill focus: Hesitating and taking time to think.
Unit IV:	Visual Art Topic- Visual Art Listening skill focus: Listening for main points Speaking skill focus: Using imprecision
Unit-V	Life Science Topic- Ocean Research; condor preservation Listening skill focus: Working out unknown vocabulary Speaking skill focus: Asking for further information
Unit-VI	Social Studies Topic- Work Listening skill focus: Identifying organizing phrases Speaking skill focus: Expressing opinions.
Unit-VII	Unit 7 Language and Communication Topic- Different languages in the United States Listening skill focus: Intensive listening for numbers Speaking skill focus: Preparing for presentation
Unit-VIII	Unit 8 Technology Topic- Inventors and Inventions Listening skill focus: identifying purpose of a story or example Speaking skill focus: Explaining a process
Unit-IX	Unit 9 Marketing and Advertising Topic- Marketing and Advertising Listening skill focus: Summarizing Speaking skill focus: Checking for understanding
Unit-X	Unit 10 Education Topic- Education Listening skill focus: Identifying opinion and supporting arguments. Speaking skill focus: Using repetition for emphasis.
Unit-XI	Unit 11 Astronomy Topic- Moon facts; amateur astronomers Listening skill focus: Identifying key words to understand details

	Speaking skill focus: Managing a conversation
Unit-XII	Unit 12 International Studies Topic- Cultural Differences Listening skill focus: Using paraphrase to work out meaning. Speaking skill focus: Managing a group discussion

Text Book (s):

- McCarthy, Michael. Touchstone (2) Student's Book. Dubai: Cambridge and Obeikan, 2009.(Writing)
- Rivers, Susan. Touchstone (2) Workbook. Dubai: Cambridge and Obeikan, 2009.(Writing

Reference Book (s):

- Blackwell, Angela. Open Forum (1) Academic Listening and Speaking. Oxford: Oxford University Press, 2007. (Listening & Speaking)

Mode of Evaluation:

- Lectures.
- Large-and small-group discussion.
- Homework and assignments.
- Interacting through E-learning.

Course title	Computer science	**Coordinator**			
Course code	104-CMS-2	**Credits Hrs**	2	**Contact Hrs**	3
Prerequisites	NIL	**Level/Year**		2/1	

Course Objective

- This course provides an overview of selected major areas of current computing technology, organization and use.
- Topics surveyed include the history of computing, data representation and storage, hardware and software organization, communications technologies, and fundamental problem solving and programming skills.

Teaching Method

Lectures, Training exercises, office hours.

Expected Learning Outcomes:

CLO-1. Understand the definition of computer science.
CLO-2. Be able to write and evaluate algorithms, able to define abstraction and top-down design.
CLO-3. Enumerate the characteristics of the Von Neumann architecture; describe non-Von Neumann parallel processing systems.
CLO-4. Be able to understand how an electronic (or magnetic) machine can represent information
CLO-5. Know what are Virtual Machine and System Software.
CLO-6. Acquainted with Network topology, Network peripherals, hardware and software.
CLO-7. Learn about Software Development Life Cycle and High-Level Language.
CLO-8. Learn about MATLAB Programming Language.

Course Contents:

Unit I:	Introduction to computer systems components The Algorithmic Foundations of Computer Science
Unit II:	Introduction to information Technology Operating Systems (Microsoft Windows)
Unit III:	Word Processing (Microsoft Word) Data Sheets (Microsoft Excel) Databases (Microsoft Access)
Unit IV:	Presentations (Microsoft Power Point) E/Mails (Microsoft Outlook)

Unit V:	E/Learning and Distance Learning
Unit VI:	Introduction to High-Level Language Programming.
Unit VII:	Introduction to MATLAB

Text Book (s):

- Yahia Halabi & Talib Sarie. Introduction to computer science and problem solving. Dar WAEl 2001. Amman Jordan. ISBN 9957 - 11 - 163 – 9

Reference Book (s):

- Invitation to Computer Science, G. Michael Schneider & Judith L. Gersting 6th Edition, ISBN-13: 9781133190820

Mode of Evaluation:

- Mid-Term Tests …… (20 %)
- Assignments and quizzes ……..……..(10%)
- Labs…….. (20 %)
- Final Exam. ……..(50 %)

Course title	Differentiation & Integration -2	**Coordinator**			
Course code	219-MATH-3	**Credits Hrs**	3	**Contact Hrs**	4
Prerequisites	119- MATH -3	**Level/Year**		2/1	

Course Objective

By the end of this course the students will be able to :

- Understand the concept of integration as an opposite process to the differentiation.
- Identify the correct rule to integrate.
- Use rules to integrate.
- Identify non-algebraic integrals.
- Analyze rounding methods and numerical integration.

Teaching Method

- Lectures, Class discussion,
- Visual presentation, Tutorial
- (video + practical)

Expected Learning Outcomes:

CLO-1. By the end of this course the students will be able to discuss :Anti-derivatives, indefinite integrals; Applications of definite integrals: Area, Solids ad Surface of revolution, Arc Length and surface of revolution , The inverse function and its derivative, the natural logarithm function ,The exponential function, integration using natural logarithm and exponential functions, General exponential function and logarithm functions, Inverse of trigonometric functions, Hyperbolic and inverse hyperbolic functions, integration by parts, Trigonometric integrals, trigonometric substitutions, Integration of rational functions, Quadratic expressions

CLO-2. Ability to differentiate between integration rules, Ability to choose and use different methods, Use functions proprieties to compute integrals, Ability to write and implement algorithms to solve different issues.

CLO-3. Discussion, work in a team, Time management, self-reliance.

CLO-4. Ability to discuss and compare results

CLO-5. Ability to handle ICT issues (Math's programs, net, etc. ...)

CLO-6. Ability to use the e-learning at the support level

CLO-7. Ability to write and implement algorithms of numerical methods.	
Course Contents:	
Unit I:	Anti-derivatives, indefinite integrals, Properties of definite integrals, fundamental theorem of calculus
Unit II:	Applications of definite integrals: Area, Solids ad Surface of revolution, Arc Length and surface of revolution, The inverse function and its derivative, the natural logarithm function
Unit III:	The inverse function and its derivative, the natural logarithm function
Unit IV:	General exponential function and logarithm functions, Inverse of trigonometric functions, Hyperbolic and inverse hyperbolic functions, integration by parts
Unit V:	Trigonometric integrals, trigonometric substitutions, Integration of rational functions, Quadratic expressions
Text Book (s): • E.W.Swokowski, M.Olinich, D.Pena, J.A.Cole, Calculus. Pws pub. Co. ,1994	
Reference Book (s):	
Mode of Evaluation: Quizzes and Assignments ……(10%) Midterm-1 ……(20%) Midterm-2 ……(20%) Final exam……(50%)	

Course title	Physics-1	**Coordinator**			
Course code	129-PHYS-4	**Credits Hrs**	4	**Contact Hrs**	5
Prerequisites	NIL	**Level/Year**		2/1	

Course Objective:

- Principles of physical measurements, conversion of units, dimensional analysis.
- All algebraic processes related to vector quantities.
- calculate different parameters dealing with motion in one dimension (average speed, velocity, instantaneous velocity, instantaneous acceleration, free falling objects)
- Newton's laws of motion, friction force and different applications.
- Work, kinetic energy, work-energy theory and conservative forces.
- Potential energy.
- Coulomb laws, electric field for point charge and electrical potential.
- Buoyant forces, Archimedes principle, pressure of fluids, equation of continuity and Bernoulli's equation.
- Static equilibrium, torque and elasticity.
- Electric conductivity, electric current and electric energy

Teaching Method:

- Lectures, Class discussion,
- Visual presentation, Tutorial
- (video + practical)

Expected Learning Outcomes:

CLO-1. To define vector, displacement , displacement, speed, velocity, force, work, energy ,power, pressure, stress, strain, specific heat
CLO-2. To define stress, strain, youngs modulus of elasticity, flow rate, Bernoulli theorem, electric field, Ohms law and resistance
CLO-3. To differentiate between vectors and scalars, differentiate between speed and velocity, concept of work energy principle,
CLO-4. To understand the concept of equation of continuity, Bernoulli theorem and to differentiate between electric field and electric potential
CLO-5. To apply laws of physics studied in this course to daily life situation
CLO-6. To apply the concept of electric charge and electric field, laws of resistance from Engineering Physics points of view.
CLO-7. Numerical problems based on mechanics (vectors, force, work energy, power)
CLO-8. Numerical problems based on equation of continuity, Bernoulli equation,

Young's Modulus of elasticity, Coulumb's law, Ohm's law	
Course Contents:	
Unit I:	Measurements, units and vectors. Motion in one dimension and motion in two dimension.
Unit II:	Newton's laws of motion. Work, kinetic energy and potential energy. Fluid dynamics. Elasticity.
Unit III:	Electric field and potential. Currents and resistance and electric energy and power.
Unit IV:	List of Topics (Practical): Measurement of errors, Helical Spring (Static Method), Refractive index, Coefficient of Viscosity by Stokes
Unit V:	List of Topics (Practical):Thin Lenses, Specific heat capacity of solids, Simple Pendulum
Unit VI:	List of Topics (Practical): Simple DC Circuits and Ohms law, Surface Tension and capillarity.
Unit VII:	List of Topics (Practical):Mechanical Equivalent of heat

Text Book (s):

- Physics for Scientist and Engineers (Serway and Jewett)

Reference Book (s):

- Physics for Engineers and Scientists jHans c. Ohanian, John t. Markert

Mode of Evaluation:

Quizzes and Assignments .....(10%)
Midterm-1 .....(20%)
Midterm-2 .....(20%)
Final exam.....(50%)

Course title	Islamic Culture -2	**Coordinator**			
Course code	112IC1-2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites	-	**Level/Year**		2/1	

Course Objective:

After the completion of this course, it is expected that the student be able to:

- Identify the implications of applying the Islamic regime the lives of individuals communities
- Knowledge of rights and rulers in Islamic law
- Recognition of human rights in the Islamic systems
- To identify the advantages of Islamic economy
- Identify the characteristics of the Islamic economy system

Teaching Method

Expected Learning Outcomes:

Course Contents:

Unit I The political side	Advantages of the political system in Islam State concept in Islam The purpose of the establishment of the state in Islam Staff of the Islamic state External relations of the Islamic countries in case of war and peace
Unit II	The rules of the political system in Islam Three authorities in the Islamic state Aspects of the application of Islam in Saudi Arabia Duties of the Guardian in the Islamic state Definition of human rights in Islam Human Rights in Islam Muslims' relations with non-Muslims in Islam
Unit III The economic side	The concept of Islamic economics Islamic economic system properties It targets the Islamic economic system.

Unit IV	Mainstays in Islamic Economics Banks, its history, and its divisions Banking transactions Insurance and its divisions
Unit V:	
Unit VI:	
Unit VII:	

Text Book (s):

- The political system in Islam-facilitation by Dr. Saad
- Economic System in Islam by Dr Omar Faihan

Reference Book (s):

- The relationship between the ruler and the ruled by Sheikh bin Baz
- Treatment of referees in the Quran and Sunnah by Dr. Abdul Salam Barjas

Mode of Evaluation:

- Mid-Term Test-1 …… (25 %)
- Mid-Term Test-2 …… (25 %)
- Final Exam. …… (50 %)

Course Syllabi and Description
For
Second Year

	Level-3	
11	111-GE-3	Engineering Drawing
12	211-ME-3	Material Science
13	212-ME-2	Engineering Mechanics (Statics)
14	211-GE-2	Learning skills
15	219-PHYS-4	Physics-2
16	229-MATH- 3	Differentiation and Integration-3

	Level-4	
17	221-ME-3	Production Technology and Workshop
18	222-ME-3	Thermodynamics-1
19	223-ME-3	Strength of Materials & Testing
20	221-GE-2	Creativity and Innovation
21	202-ARAB- 2	Arabic Writing
22	222-GE-2	Engineering Programming
23	319-MATH- 3	Differential Equations

Course title	Engineering Drawing	**Coordinator**			
Course code	111-GE-3	**Credits Hrs**	**3**	**Contact Hrs**	3
Prerequisites		**Level/Year**		3/2	

Course Objective

The main purpose of engineering drawing (1) is to make students able to write the principles of geometrical construction and tell the fundamentals of orthographic projection, sectional and, isometric views. In addition, at the end of this course, the students will acquire imagination skills for projections of machine parts and apply international standards of dimensioning on engineering drawings.

Teaching Method
Lectures and training exercises

Expected Learning Outcomes:

CLO-1. State the principles of geometrical construction and tell the fundamentals of orthographic projection, Sectional and, isometric views
CLO-2. Reconstruct two-dimensional representation into 3D images and vice versa (Acquire spatial thinking).
CLO-3. Apply imagination skills for projections of machine parts and apply international standards of dimensioning on engineering drawings
CLO-4. Illustrate graphical skills including freehand sketching and drawings to scale
CLO-5. Interpret technical drawings, including sections

Course Contents:

Unit I:	Sheet Sizes, Scales, Lines and Lettering, Scales Lettering – Engineering drawing tools and their using
Unit II:	Tangency operations
Unit III:	Projections – Isometric views
Unit IV:	Projections –Multi-views
Unit V:	Free hand sketch – Dimensions
Unit VI:	Missing views

Unit VII:	Sectional Orthographic Projections Surfaces intersections, relations between point, line and surface

Text Book (s):

- David E. Goetsch, William S. Chalk, Raymond L. Rickman, John Nelson. Technical Drawing and Engineering Communication, 6th Edition, 2010.
- By Frederick E Giesecke, Ivan L Hill, Henry C Spencer, Alva Mitchell, John T Dygdon, James E. Novak, Shawna Lockhart, Marla Goodman. Technical Drawing with Engineering Graphics, 14th Edition, 2010. Peachpit Press

Reference Book (s):

- Colin Simmons Dennis Maguire, Manual of Engineering Drawing, 4th Edition. Technical Product Specification and Documentation to British and International Standards, Elsevier, 2012.

Mode of Evaluation:

- Class Work----------10%
- Home Work----------10%
- Mid-term exams---------- 30%
- Final Exam----------50%

Course title	Materials Science	**Coordinator**			
Course code	211-ME- 3	**Credits Hrs**	**3**	**Contact Hrs**	3
Prerequisites	107-Chem-4 129 -Phys-4	**Level/Year**		3/2	

Course Objective

- Use of new technology of material science.
- Understand the theory of atomic structure and interatomic bonding and theory of crystal structure of materials.
- Know of the theory of diffusion.
- Analyze of imperfections in crystals.
- Acquire some skills in mechanical testing and evolution of materials.
- Determine of phase diagram and cooling curves of metals and alloys, an iron-carbide diagram for steel and cast iron

Teaching Method:

- Lectures
- Discussion
- E-Learning

Expected Learning Outcomes:

CLO-1. State the differences between all types of engineering materials
CLO-2. Recognize the structure of metals on the macro/micro – scale
CLO-3. Differentiate the material types based on their apparent properties
CLO-4. Create some samples for microstructure examination
CLO-5. Analyze the cooling curves to determine the phase transformation temperature
CLO-6. Interpret different diagrams, Apply skills in physical metallurgy problems
CLO-7. Analyze microstructure of materials in a group, Choose appropriate resources, time and group activity
CLO-8. Evaluate the experiment results, Calculate results and report them

Course Contents:

Unit I:	Introduction the materials
Unit II:	Atomic bond
Unit III:	Crystal structure

Unit IV:	Crystals Imperfection
Unit V:	Atomic Diffusion
Unit VI:	Mechanical properties and behaviour
Unit VII:	Strengthening, strain hardening, Phase diagram, Iron-iron carbide diagram

Text Book (s):

- Callister, W. D. ,"Material Science and Engineering: An Introduction", 6th. Ed., New York, 2007

Reference Book (s):

- Introduction to materials science and engineering, Callister 7th addition

Mode of Evaluation:

- Mid-term exam----------30%
- Practical exam (oral and writing exam) , quizzes and reports----------20%
- Final exam----------50%

Course title	Engineering Mechanics (Statics)	**Coordinator**			
Course code	212- ME-2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites		**Level/Year**		3/2	

Course Objective

- Understand the vector and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions.
- Understand the principle of work and energy.
- Comprehend the effect the friction on equilibrium.

Teaching Method

- Lecture
- Demonstration in tutorial classes
- Interacting through E-learning

Expected Learning Outcomes:

CLO-1. State the principles of Mechanics, Reproduce principles of Mechanics for the idealizations of Statics
CLO-2. Explain the principles of Mechanic, Solve the realistic problems encountered in engineering practice
CLO-3. Demonstrate basic engineering problems independently
CLO-4. Judge static problems within different groups
CLO-5. Interpret the practical problems, Assess problems using software

Course Contents:

Unit I:	Introduction to Engineering mechanics
Unit II:	General Principles - Force and Force Vectors
Unit III:	Equilibrium of a Particle - Force System Resultants
Unit IV:	The concept of static torsors
Unit V:	Structural Analysis
Unit VI:	Friction

Unit VII:	

Text Book (s):

- Engineering Mechanics-Statics and Dynamics-R.C. Hibbeler, 2009, 12th edition.

Reference Book (s):

- Meriam, J. and L.G. Kraige, "Engineering Mechanics", Vol. 1-Statics and Vol.2-Dynamics, John Wiley and Sons Inc, 2001

Mode of Evaluation:

- Midterm exam1----------15%
- Quiz----------5%
- Homework----------5%
- Midterm exam2----------15%
- FINAL EXAM----------50%

Course title	Learning Skills	**Coordinator**			
Course code	211-GE-2	**Credits Hrs**	2	**Contact Hrs**	28
Prerequisites		**Level/Year**		3/2	

Course Objective :

Upon completing this course, it is expected that students will be able to:

- The main objective is to learn strategies for time management, use of library resources, Note taking,
- E-learning, self-learning, critical thinking and effective communication with a college setting.

Teaching Method

- Traditional class room
- Blended
- E-learning

Expected Learning Outcomes:

CLO-1. Describe time management and organizational skills
CLO-2. Apply successful test takingstrategies ,
CLO-3. Apply and analyse individual learning styles and critical thinking techniques
CLO-4. Explain knowledge using modern tools
CLO-5. Demonstrate online learning environment
CLO-6. Appraise effective strategies to utilize class time with multidisciplinary teams.
CLO-7. Relate Library Resources with ethics
CLO-8. Demonstrate better reading & vocabulary skills
CLO-9. Illustrate the communication effectively

Course Contents:

Unit I:	Introductions/Blackboard/Connect ND/Email
Unit II:	Library & Campus Resources (Learning Communities), Time Management, Note Taking.
Unit III:	Learning Styles & Effective Studying, Test Taking Skills, Staying Healthy Mentally & Physically

Unit IV:	Registration Information, Tools for Academic Success, Your Major & Your Career

Text Book (s):

- Numerical Methods S.R.K. Iyengar, R.K. Jain, Published by New Age International (P) Ltd., Publishers, 2009.

Reference Book (s):

- Jim Ford, Jane Knight, Emily McDonald. Learning Skills. UT Publication, 2001

Mode of Evaluation:

- Midterm exam1----------15%
- Quiz----------5%
- Homework----------5%
- Midterm exam2----------15%
- Final exam ----------50%

Course title	Physics-2	**Coordinator**			
Course code	219 -PHYS-4	**Credits Hrs**	**4**	**Contact Hrs**	5
Prerequisites	129-PHYS-4	**Level/Year**		3/2	

Course Objective

This course aims to introduce basic knowledge of temperature and heat,, the concept of the first and second law of thermodynamics, fluid motion, simple harmonic motion (SHM) - compute the frequency and period of simple harmonic oscillator (SHM) - the characteristics of waves- the nature of sound waves - factors affecting sound waves - Doppler effect. Study how light waves interfere - diffract (single slit), polarize. Study Black body radiation -Planck's quantum hypothesis. Calculate the energy of photon, de Broglie wavelength of an electron. Study the line spectra of atoms and Bohr model of atoms - specific heat of solid - the basic idea of Superconductivity.

Teaching Method

- Lectures
- Class discussion
- Visual presentation
- Tutorial (video + practical)

Expected Learning Outcomes:

By the end of this course the student should be able to:

CLO-1. recognize physics of temperature, recognize physics of heat
CLO-2. recognize the first and second law of thermodynamics
CLO-3. recognize fluid motion, recognize the condition for SHM, to compute the frequency and period of SHM,
CLO-4. determine the position, velocity and acceleration for SHM and to compute KE and PE of a simple harmonic oscillator.
CLO-5. learn the characteristics of a wave, determine the position equation for waves, the rate at which wave transport energy and the consequences of wave superposition.
CLO-6. know the nature of sound waves, factors affecting sound waves, to determine the intensity and sound intensity level of sound waves and Doppler effect.
CLO-7. study how light waves, interfere, diffract (single slit), polarize ,know the magnetic field, ampere's and Faraday's laws, study about Black body radiation, Planck's quantum hypothesis and photoelectric effect ,calculate the energy of photon, de Broglie wavelength of an electron.study about the line spectra of atoms and Bohr model of atoms ,study specific heat of solid, study the basic idea of Superconductivity.

Course Contents:	
Unit I:	kinetic theory of gases; Temperature and heat
Unit II:	First and second law of thermodynamics Fluid Motion
Unit III:	Simple Harmonic Motion Wave motion and Sound
Unit IV:	The magnetic field, ampere's and Faraday's law Interference, Diffraction and Polarization of light Plank's quantum theory of radiation
Unit V:	Photoelectric effect and photons Compton Scattering
Unit VI:	Wave properties of particles Atomic Spectra and Bohr model of the atom
Unit VII:	Lattice vibrations and specific heat of Solids Superconductivity

Text Book (s):

- Halliday, Resnick & Walker, Fundamental of Physics, John Wiley & Sons, 2008.
- Physics for scientist and engineers with modern physics by Serway (2005), Saunders College Publisher
- Richard Wolfson, " Essential University Physics", 2006.
- Hugh D. Young, " University Physics ", Volume 2, 2004.

Reference Book (s):

- University Physics by Western and Crummet University Physics by Resnick and Halliday
- Hugh D. Young and Roger A. Freedman, " University Physics with Modern Physics", 11th Ed., 2003.
- John D. Cutnell and Kenneth W. Johnson, " Physics ", 2003.

Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work and Assignments …….. (20 %)
- Final Exam. …….. (50 %)

Course title	Differentiation & Integration -3	**Coordinator**			
Course code	229-Math-2	**Credits Hrs**	**3**	**Contact Hrs**	45
Prerequisites	219-Math-3	**Level/Year**		3/2	

Course Objective :

What is the main purpose for this course? The aim of the course is to learn the theory of functions of several variables including topics ranging from limits and continuity, partial differentiation up to double integrals (integrals for functions of two variables). The second perspective is to train students to manipulate sequences and series together with different tests for convergence. Finally, we make bridges between series and functions of one variable with addressing power series theory and applications.

Teaching Method

- Traditional class room
- Blended learning

Expected Learning Outcomes:

CLO-1. Limits, the two-path rule; continuity; partial differentiation; implicit differentiation for functions of two and three variables; chain rule; extrema (local minima and maxima and saddle points); tangent planes and normal lines; double integrals and their applications.
CLO-2. Sequences; convergence tests for sequences (substitution, geometric, equivalence, sandwich theorem, absolute convergence); series and recurrent series; convergence tests for series and positive term series (nth term test, geometric, p-series, comparison, limit comparison, ratio, root, alternating, absolute convergence); power series (convergence radius and convergence interval), power series representation of functions; Maclaurin and Taylor series.
CLO-3. Recognition of the differences between (a) Techniques of partial differentiation (b) Techniques of double integration, Sequences, series and power series.
CLO-4. Some application of the course: solution methods for partial differential equations supporting real-life problems, area and volume calculation.
CLO-5. Ability to differentiate between properties of functions of one variable and several variables.
CLO-6. Ability to differentiate between sequences, series and power series
CLO-7. Ability to choose and use the adequate calculus Technique
CLO-8. Use of learned techniques to solve modeling life issue
CLO-9. Discussions, Interaction and work in a team, time management, self-reliance.

CLO-10. Ability to handle complex models that describe real-life problems in a wide range of engineering domains. CLO-11. Ability to understand the mathematical models supporting scientific software used to solve engineering problems CLO-12. A mathematical support and background for oral and writing presentations	
Course Contents:	
Unit I:	Functions of several variables: Definitions of functions of several variables, domain and range, level curve of a function.
Unit II:	Limits and continuity: limit notation, definition of limit, two-path rule, definition of continuous functions.
Unit III:	Partial derivatives: Definition of the first partial derivatives, notations for partial derivatives, second partial derivatives.
Unit IV:	Chain rules: chain rule. Tangent Plans and Normal Lines.
Unit V:	Extrema of functions of several variables: local extrema, test for local extrema.
Unit VI:	Double Integration : Definitions and evaluation theorems for double integrals.
Unit VII:	Area and Volume
Unit VIII:	Sequences: Notation, definitions, theorems.
Unit IX:	Convergent or Divergent Series: Definitions, theorems, nth-term test.
Unit X:	Positive- Term Series: Definitions, theorem, Basic and limit comparison tests.
Unit XI:	The Ratio and Root tests.
Unit XII:	Alternating series and absolute convergence: Definitions, theorems, alternating series test, absolute convergence.
Unit XIII:	Power series: Definitions, theorems.
Unit XIV:	Power series representations of functions: Definitions, theorems.
Unit XV:	Maclaurin and Taylor series.
Text Book (s): • Calculus of Several Variables, Pence, Dennis D., Cole, Jeffery A., Pence, Dennis, Olinick,	

Michael, Swokowski, Earl Published by Brooks/Cole Pub Co (1995)
Reference Book (s): • The Calculus of Functions of Several Variables by Dan Sloughter
Mode of Evaluation: • Mid-Term Tests (Not less than two Exams)…….. (30 %) • Practical Work and Assignments …….. (20 %) • Final Exam. …….. (50 %)

Course title	Production Technology and Workshops	**Coordinator**			
Course code	221 ME-3	**Credits Hrs**	3	**Contact Hrs**	3
Prerequisites	111- GE-3	**Level/Year**		4/2	

Course Objective

The overall aim of the present course is to explain the basics of production technology and workshop operations as well as a brief review of the engineering materials and the principals of automobile and electricity which may be useful in better understanding of the field of manufacturing technology

Teaching Method

- Lectures,
- Theoretical lectures
- Practical workshops

Expected Learning Outcomes:

CLO-1. Recognize basics of production technology through the theoretical study
CLO-2. Apply the basics of production technology through the theoretical study and practical training at different workshops
CLO-3. Interpersonal Skills & Responsibility
CLO-4. Communication, Information Technology, Numerical

Course Contents:

Unit I:	Introduction to production engineering
Unit II:	Introduction to industrial safety
Unit III:	Engineering materials and Their properties
Unit IV:	Engineering measurements
Unit V:	Metal casting processes, Sheet metal work and fitting, Joining of metals
Unit VI:	Principals of machining, Carpentry, Automobile workshop,
Unit VII:	Electricity workshop, Revision

Text Book (s): • Chapman: "Workshop Technology". Vol. : 1 , 2 & 3. Butterworth-Heinemann, latest edition. •	
Reference Book (s): • Lecture Notes	
Mode of Evaluation: • Practical work and reports----------20% • Midterm exams----------30% • Final exam----------50%	

Course title	Thermodynamics-1	**Coordinator**			
Course code	222- ME-3	**Credits Hrs**	3	**Contact Hrs**	3
Prerequisites	119-MATH-3 129-PHYS-4	**Level/Year**		4/2	

Course Objective

- Use of new technology for the treatment and synthesis of electric generating power plant
- Presents new concepts and definitions of statistical thermodynamics
- Prepare the student to effectively use thermodynamics in the practice of engineering
- Assist the student in gaining an understanding of thermodynamics
- Provide an adequate preparation for the study of more advanced topics in thermodynamics that the department might wish to have included in such course
- Acquire some skills of designing steam power plants, gas turbine power plants, combined cycle power plant, desalination systems and the measurements that related to its operation
- Understand the theory and application of the first law, second law, and steady flow and steady-state applications
- Present the material on the irreversibility and availability.

Teaching Method

- Lectures
- Discussion
- Solving problems

Expected Learning Outcomes:

CLO-1. State the first and second law of thermodynamics, Define the different properties and state of a substance
CLO-2. Apply first and second laws of thermodynamics to solve problems, Analyze the problems of determination of the variation of many parameters during different processes
CLO-3. Analyze the thermodynamics problems and justify the choose of this way to have the solution
CLO-4. Demonstrate the balances used for resolving the problems
CLO-5. Interpret the different graphs and criticize the influence of different parameters

Course Contents:

Unit I:	Introduction

Unit II:	Fundamental concepts and definitions
Unit III:	Properties of pure substances
Unit IV:	Work and heat
Unit V:	First law of thermodynamics and its applications
Unit VI:	The second law of thermodynamics, Air-standard Brayton cycle Entropy, reversibility, and irreversibility
Unit VII:	Applications of steady state and steady flow, Uniform flow and some processes

Text: Book (s):

- Michael J. Moran and Howard N. Shapiro, "Fundamentals of Engineering Thermodynamics",2004

Reference Book (s):

- Richard E. Sonntag, "Fundamentals of Thermdynamics",2004
- Richard E. Sonntag, Claus. B. and Gordon J. VanWylen, "Fundamentals of Thermodynamics", John Wiley&Sons, 2002

Mode of Evaluation:

- Quizzes and assignments on blackboard----------15%
- Midterm exam 1----------10%
- Midterm exam 2----------15%
- Practical exam----------10%
- Final exam----------50%

Course title	Strength of Materials and Their Testing	**Coordinator**			
Course code	223 - ME-3	**Credits Hrs**	3	**Contact Hrs**	3
Prerequisites	211- ME-3	**Level/Year**		4/2	

Course Objective

The main purpose of studying strength of materials and their testing in mechanical engineering is to provide graduate engineers with the means of analyzing and designing various machines components and load-bearing structures. Both analysis and design of a given structure involve the determination of stresses and strain. Then, student - engineers will be able to select/calculate/define the suitable material/loads/dimensions for a given application under a given conditions. This course has been carefully designed to meet the student's basic needs at this level.

Teaching Method

- Lecture
- Discussion
- Solving problems

Expected Learning Outcomes:

CLO-1. State assumptions and general objectives for strength of materials theories.
CLO-2. Define internal loads and type of loading.
CLO-3. Calculate simple design problems involving stresses and strain in two dimensions.

Course Contents:

Unit I:	Introduction to strength of materials and static review, general objective and assumptions of strength of materials, internal loads, different types of loading
Unit II:	Tension, compression, normal stress, normal strain, mechanical properties, Hooke's law, Poisson ratio, allowable stress
Unit III:	Deformation of Axially Loaded Members, thermal stress and Thermal Strain
Unit IV:	Shear stress, Shear strain, Hooke's law, shear modulus
Unit V:	Torsion formulas, polar moment, Angle of Twist , Torsion of Solid Non-Circular Sections, Thin walled pressure vessels, longitudinal and transversal stresses in cylindrical vessels, stress in spherical vessels

Unit VI:	Pure bending, bending stress, moment of inertia of sectional area, radius of gyration
Unit VII:	Shear Force and Bending Moment diagram
Unit VIII:	stress and strain transformations, General equations of plane stress and strain Principal Stresses, Maximum in-plane shear stress and strain, Mohr's Circle, Triaxial stress and strain, Absolute Maximum shear strain

Text Book (s):

- Mechanics of Materials Hardcover – January 4, 2011 by Ferdinand Beer (Author), Jr., E. Russell Johnston (Author), John DeWolf (Author), David Mazurek (Author). ISBN-13: 978-0073380285 ISBN-10: 0073380288

Reference Book (s):

- Mechanics of Materials, Hardcover – April 1, 2010, by Russell C. Hibbeler (Author) ISBN-13: 978-0136022305 ISBN- 10: 0136022308

Mode of Evaluation:

- Blackboard (E-Learning) activities----------10%
- First Mid-Term Exams----------15%
- Second Mid-Term Exams----------15%
- Reports and tutorial Work----------10%
- Final Exam----------50%

Course title	Creativity and Innovation	**Coordinator**			
Course code	221-GE-2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites		**Level/Year**		4/2	

Course Objective :

Upon completing this course, it is expected that students will be able to:

- Creativity and innovation are integral to an organization's ability to survive and thrive in today's competitive marketplace. The main purpose of the course is to provide ample training and exposure to the students to be able to work independently and innovatively in new projects and work assignments. The specific aim is to inculcate innovation based thinking ability to approach professional challenges.

Teaching Method

- Traditional class room
- blended e-learning,
- Presentation

Expected Learning Outcomes:

CLO-1. Define the roles of skill, experience, motivation and culture in creative endeavour
CLO-2. Explain some potential disruptive innovations and take advantage of 'open' innovation
CLO-3. Develop case study analysis skills (specifically, identifying critical issues in case studies and applying course material to case studies).
CLO-4. Demonstrate the process involved in managing creativity or innovation effectively and apply this knowledge to your own creative idea or innovation
CLO-5. Analyze the influence of problem-solving techniques, team processes, and environmental conditions on creativity in organizations.540.
CLO-6. Assess the relationship between creativity, innovation and entrepreneurship and how it influences business sustainability

Course Contents:

Unit I:	What is creativity and innovation

Unit II:	The need for creativity, invention and innovation
Unit III:	Sources of, and barriers to creativity & innovation
Unit IV:	Creativity tools
Unit V:	Creative thinking and idea generation
Unit VI:	Types and dimensions of innovation
Unit VII:	The innovation process
Unit VIII:	Creative communication of business arguments
Unit IX:	Innovation trends.

Text Book (s):

- Wagner, Tony. *Creating Innovators: The Making of Young People Who Will Change the World.* New York: Scribner, 2012.
- Dawson, Patrick and Constantine Andriopoulos (2014), Managing Change, Creativity, & Innovation, Sage Publications, London, England. Second Edition, ISBN: 978-1-4462-6721-9 (pbk) or ISBN 978-1-4462-6720-2.
- Kelley, Tom, Jonathn Littmant, and Tom Peters. The Art of Innovation: Lessons in Creativity from IDEO, America's Leading Design Firm. New York: Doubleday, 2001.
- D. Tanner, *Total Creativity in Business and Industry*, Advanced Practical Thinking Training, 1997.

Reference Book (s):

Mode of Evaluation:

- Quizzes and Assignments ----------20%
- Midterm exams----------30%
- Final exam----------50%

Course title	Arabic writing	**Coordinator**			
Course code	202-ARAB- 2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites	-	**Level/Year**		4/2	

Course Objective

- To write the correct spelling according to right rule
- To learn techniques of Arabic writing
- To avoid frequent errors
- To master the use of punctuation

Teaching Method

- Lectures & E Learning classes
- Dialogues and Discussion
- Self-Learning

Expected Learning Outcomes:

CLO-1. Enable student to write according to writing rules
CLO-2. Learn the techniques of Arabic writing

Course Contents:

Unit I: Introduction to Arabic Writing	Introduce student to the course, its main goal and included scientific topics Clarify the course learning
Unit II :Hamza	Hamza at beginning, middle and end of words
Unit III: Punctuation	Punctuation rules
Unit IV: Error	Common errors
Unit V: Rules of Writing	Essay Research Letter Report Summary
Unit VI:	

Unit VII:	

Text Book (s):

- The Art of Arabic Writing- Mohammed Saleh Shanti

Reference Book (s):

- The rule of spelling-Abdul Salam Haroun
- Dictionary of Parsing and spelling-Amel Jacob
- Notebook-Abdul Hadi Harb

Mode of Evaluation:

- Mid-Term Test-1 …… (20 %)
- Mid-Term Test-2 …… (20 %)
- Oral Participation…… (05 %)
- Assignment…… (05 %)
- Final Exam. …… (50 %)

Course title	Engineering Programming	**Coordinator**			
Course code	222-GE-2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites	104-CMS-2	**Level/Year**		4/2	

Course Objective

- Recognize the necessary basics of using the computer in engineering applications.
- Acquire the knowledge and experience of writing the algorithms for some engineering applications.
- Recognize the basics of the methods of numerical analysis and solution of linear and nonlinear equations for some engineering applications.
- Acquire the knowledge and experience for programming and drawing using the MATLAB software

Teaching Method

- Lectures,
- Main library,
- Online learning,
- Discussions,
- Self-learning,
- Tutorials,
- Co-Learning

Expected Learning Outcomes:

CLO-1. Describe arrays and matrix operations
CLO-2. Choose appropriate loops and conditional logics in programming
CLO-3. Apply computer programming to solve engineering problems
CLO-4. Evaluate the output of the computer program

Course Contents:

Unit I:	Introduction to MATLAB
Unit II:	Array and Matrix Operations
Unit III:	Loops and Conditional logics
Unit IV:	Solving Equations

Unit V:	Programming for Numerical mathematics
Unit VI:	Graphics
Unit VII:	Importing and Exporting Data
Unit VIII:	Revision

Text Book (s):

- MATLAB Programming for Engineers, by Stephen J. Chapman, Fourth Edition, Cengage-Engineering, 2007

Reference Book (s):

- An Engineers Guide to MATLAB by Edward B. Magrab, Shapour Azarm, Balakumar Balachandran, James Duncan, Keith Herold, Gregory Walsh, Third Edition.

Mode of Evaluation:

- Quizzes and assignments on Blackboard----------5%
- Midterm exam 1----------15%
- Midterm exam 2----------15%
- Practical exam----------15%
- Final exam----------50%

Course title	Differential Equations	**Coordinator**			
Course code	319-Math-3	**Credits Hrs**	**3**	**Contact Hrs**	45
Prerequisites	219-Math-3	**Level/Year**		4/2	

Course Objective :

Learning basic concepts and methods for solving first order differential equations and higher order linear differential equations.

Teaching Method

- Traditional class room
- Blended
- E- learning

Expected Learning Outcomes:

CLO-1. Ability to classify and recognize linear systems of differential equations and non-linear differential equations.
CLO-2. Understanding the existence and uniqueness of solutions for initial value problems and the linear independence of solutions.
CLO-3. Recognizing the importance of a differential equations as a powerful tools to better understand some scientific and engineering problems.
CLO-4. Capacity for self-directed learning.

Course Contents:

Unit I:	Elimination of constants, First order differential equations(Separable variables, Homogeneous, Exact, Integrating factor, Linear, Bernoulli and Recatti,)
Unit II:	Second order differential equations (Independence and linear dependence of functions, Wronsikian) Higher order differential equations with constant coefficients, Non-homogeneous differential equations, reduction of order, Undetermined coefficient method.
Unit III:	Variation of parameters method
Unit IV:	Power series solution about ordinary and singular points

Text Book (s):

- D. G. Zill, A First Course in Differential Equations with Modeling

Reference Book (s):
Mode of Evaluation: • Midterm exam 1----------25% • Midterm exam 2----------25% • Final exam----------50%

Course Syllabi and Description
for
Third Year

	Level-5	
24	311-ME-3	Metal Cutting Processes
25	312-ME-3	Mechanical Engineering Drawing
26	313-ME-2	Engineering Mechanics (Dynamics)
27	218-EE-3	Electric Engineering-1
28	113-IC1-2	Islamic Culture-3
29	329-MATH- 3	Linear Algebra
30	301-NGL-2	Technical Reports Writing

	Level-6	
31	321-ME-3	Theory of Machines
32	322-ME-3	Fluid Mechanics
33	328-EE-3	Electric Engineering-2
34	419-MATH-3	Numerical Methods
35	329-STAT-2	Principles of Statistics and Probability
36	114-IC1-2	Islamic Culture-4
37	400-ME-0	Summer Internship

Course title	Metal Cutting Processes	**Coordinator**			
Course code	311-ME-3	**Credits Hrs**	3	**Contact Hrs**	3
Prerequisites	(221-ME-3) & (211-ME-3)	**Level/Year**		5/3	

Course Objective

This course aims to cover the principles of the conventional machining processes, the different conventional machining operations, the tool and work piece fixation methods, the machine specifications, and the kinematic systems represent main items in this course. Furthermore, the course includes finishing operations and engineering metrology. This course covers the determination of cutting forces (graphically and numerically), and the estimation of the machining times in each operation. Also, it covers the chip breakers in machining and the concept of machinability and its improvement. This course aims to prepare the student to effectively using the non-conventional machining methods.

Teaching Method

- Class lectures
- Homework theoretical sheets
- Practical assessments
- Tutorial(solved problems)
- Group discussion

Expected Learning Outcomes:

CLO-1. Define the basics and fundamentals of the metals machining.
CLO-2. List the features and details of each machining techniques.
CLO-3. Estimate machining parameters involved in machining a product.
CLO-4. Use machines to shape various materials
CLO-5. Estimate the machining times and the machining forces.
CLO-6. show self-confidence to work without supervision
CLO-7. Demonstrate ability to work in teams

Course Contents:

Unit I: Basic Concepts of Machining General Introduction:	Manufacturing Processes – Types of machining, Orthogonal and oblique cutting, Cutting Conditions, Chip types.
Unit II: Conventional	Turning Processes: Principles, operations, the machine (center lathe) components, Drilling Processes: Principles, operations, the machine

Machining Processes:	components, Milling Processes: Principles operations, the machine components. Planning and shaping Processes: Principles, operations, the machine components. Grinding Processes: Principles, abrasives, grinding wheels, fixation of grinding wheels, process types. Estimation of machining times in different conventional machining processes. Finishing Processes: Principles, operations, the machine components. Machining forces and Merchant's Circle Diagram (MCD). Cutting temperature, application of cutting fluid, machinability, Failure of cutting tools and tool life, and cutting tool materials, Machinability and its improvements.
Unit III: Non-conventional Machining:	Different Non-conventional machining processes (Electrical Discharge Machining –Electron Beam Machining – Laser Beam Machining - Electro Chemical Machining –Ultra sonic Machining – Water Jet Machining, Abrasive Jet Machining etc.)

Text Book (s):

- Serope Kalpakjian and Steven R Schmid, "Manufacturing Processes for Engineering Materials", Pearson Education Limited, 2008
- David A. Stephenson, John S. Agapiou, "Metal Cutting Theory and Practice "Taylor & Francis Group, 2006

Reference Book (s):

- Benjamín W. Niebel, Alan B. Draper, Richard A. Wysk, "Modern Manufacturing Process Engineering", McGraw-Hill, 2002
- Mikell P. Groover, "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", John Wiley & Sons, 2010
- E. Edward Moor Trent, Paul Kenneth, "Metal Cutting", Butterworth-Heinemann, 2000
- Degormo E. P., Black, J.T., and Kohser, R. A., "Materials and Processes in Manufacturing", 9th Edition, John Wiley & Sons, 2003.

Mode of Evaluation:

- Quizzes----------10%
- First Mid-Term Exams (Theoretical and Practical)----------10%
- Second Mid-Term Exams (Theoretical and Practical)----------15%
- Practical Work (Lab Exam at week14)----------15%
- Term Final Exam----------50%

Course title	Mechanical Engineering Drawing	**Coordinator**			
Course code	312-ME-3	**Credits Hrs**	3	**Contact Hrs**	4
Prerequisites	111-GE-3	**Level/Year**		5/3	

Course Objective

- Recognize assembly drawings and sections.
- Create 2D and 3D assembly drawings.
- Illustrate and interpret engineering drawing standards.
- Use Solid Works for creating assemblies and producing professional engineering working drawings.

Teaching Method

- Lectures
- Training Exercises

Expected Learning Outcomes:

CLO-1. Recognize assembly drawings and sections
CLO-2. Create 2D and 3D assembly drawings
CLO-3. Demonstrate the use of SolidWorks for creating assemblies and producing professional engineering working drawings
CLO-4. Illustrate and interpret engineering drawing standards

Course Contents:

Unit I: Conventional Practices for Orthographic Projections and Sectional Views	Conventional Practices in Orthographic views: Half Views, Partial Views, and Aligned Views. Conventional Practices in Sectional views: Conventions for Ribs, Webs, Spokes, and lugs in Full Sectional View, Broken Section, Removed Section, Revolved Section, Offset Section, and Auxiliary Sectional Views. Simplified Representations of Standard Machine Elements.
Unit II: Standards and Conventions in Drawing and Dimensioning	Limits, Fits and Tolerances, Symbols, and Surface Finish. Threads, Bolts and Nuts. Welded and Riveted Joints.
Unit III: Detailed and Assembly Drawings	Working Drawings and its Components. Detailed Drawings. Assembly Drawings.

	Practices of Detailed and Assembly Drawings.
Unit IV: Computer Aided Drawing (CAD)	Isometric Drawing (Parts). Assembly Drawing. Creating 2D drawings from a part or an assembly. Dimensioning Drawings.

Text Book (s):

- K. L. Narayana, P. Kannaiah, and K. Reddy, "Machine Drawing", 5th Edition, 2016, New Age International Ltd. Publishers. ISBN: 978-81-224-4054-6.

Reference Book (s):

- Colin H. Simmons, Dennis E. Maguire, Neil Phelps, "Manual of Engineering Drawing", 3rd Edition, 2009, Elsevier Ltd. ISBN: 978-0-7506-8985-4.
- Bertoline–Wiebe, "Engineering Graphics – Fundamentals of Graphics Communication", 5th Editions, 2006, McGraw-Hill, ISBN: 0-390-73230-3

Mode of Evaluation:

- Mid-1 Exam……(15%)
- Mid-2 Exam……(15%)
- Assignment and Quiz……(20%)
- Final Exam……(50%)

Course title	Engineering Mechanics (Dynamics)	**Coordinator**			
Course code	313- ME-2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites	Nil	**Level/Year**		5/3	

Course Objective

- Understand the laws of motion, the kinematics of motion and the interrelationship.
- Write the dynamic equilibrium equation.
- Understand the concepts and solve the problems

Teaching Method

- Lectures
- Training Exercises

Expected Learning Outcomes:

CLO-1. State the principles of dynamics outline the principles for the idealizations of Statics and Dynamics
CLO-2. Apply the principles of dynamics to engineering problems
CLO-3. Estimate the realistic problems encountered in engineering practice
CLO-4. Evaluate basic engineering problems independently
CLO-5. Illustrate problems of dynamics in groups
CLO-6. Interpret the problems on dynamic mechanisms
CLO-7. Assess the problems using software

Course Contents:

Unit I:	Newton's Laws of Motion
Unit II:	Kinematics of Particles
Unit III:	Kinetics of Particles
Unit IV:	Plane Kinematics of Rigid Bodies
Unit V:	Plane Kinetics of Rigid Bodies
Unit VI:	Free Vibration of Particles

Text Book (s): • Vector Mechanics for Engineers, Dynamics, 7th Edition, F. B. Beer, E. R. Johnston, W. L. Clausen, McGraw Hill, 2003.	
Reference Book (s): • Engineering Mechanics: Dynamics, 1st Computational Edition, R. W. Soutas-Little, D. J. Inman, CL-Engineering, 2007.	
Mode of Evaluation: • Mid-1 Exam……(15%) • Mid-2 Exam……(15%) • Homework +Quiz……(20%) • Final Exam……(50%)	

Course title	Electric Engineering-1	**Coordinator**			
Course code	218- EE-3	**Credits Hrs**	3	**Contact Hrs**	4
Prerequisites		**Level/Year**		5/3	

Course Objective

Course aims to introduce basic concepts of Electric quantities and circuit elements. Kirchhoff's laws. Mesh and node analyses. Sinusoidal steady-state analysis using phasors. Techniques and theorems of AC circuit analysis. Steady state power analysis, Power factor.

Teaching Method

- Lectures,
- Discussion,
- Self-learning,
- Tutorial sheets

Expected Learning Outcomes:

CLO-1. Understand fundamentals of electric quantities: voltage, current, electric power and energy, dependent and independent voltage and current sources.
CLO-2. Apply different techniques for solving electric circuits that operate with DC sources.
CLO-3. understand the difference between DC and AC sinusoidal sources, the new components that exist in AC circuits:
CLO-4. Apply network theorems to simplify a resistive circuit by finding the Thevenin or Norton equivalent of a two-terminal network
CLO-5. Evaluate effective or rms values of AC voltages and currents, find the phasor voltage (current) for a given sinusoidal voltage (current), and find the sinusoidal voltage (current) for given phasor voltage (current) and frequency.
CLO-6. Convert an AC steady-state circuit to a phasor circuit and analyze a phasor circuit using Ohm's law, KCL, KVL, reduction of series and parallel impedances, and voltage and current divisions.
CLO-7. Calculate AC steady-state power dissipated by the circuit elements in a circuit and express the concepts of power factor, complex power, and conservation of power.

Course Contents:

Unit I:	Fundamental electric quantities: voltage, current, power and energy
Unit II:	Resistance, capacitance and inductance, Kirchhoff's laws (KVL & KCL), Source
Unit III:	Equivalence and series and parallel equivalent resistance
Unit IV:	Mesh current (loop) and node voltage analysis
Unit V:	Circuit theorems
Unit VI:	Sinusoidal excitation, average and effective values
Unit VII:	Steady state A.C. circuit and impedance and phasor diagrams
Unit VIII:	AC power analysis Power triangle and power factor correction

Text Book (s):

- K. Alexander and M.N.O. Sadiku, Fundamentals of electric circuits, 4th ed, McGraw-Hill,
- Basic Engineering Circuit Analysis", J. D. Irwin, Fourth edition, Macmillan, most recent edition.

Reference Book (s):

- Introduction to Electric Circuits", R. G. Dorf, Second edition, Willey, most recent edition
- Electric Circuits", James W. Nilsson and Susan A. Riedel, Addison Wesley, most recent edition.

Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…… (30 %)
- Practical Work, Quizzes and Assignments …… (20 %)
- Final Exam. …… (50 %)

Course title	Islamic Culture -3	**Coordinator**			
Course code	113IC1-2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites	-	**Level/Year**		5/3	

Course Objective

After the completion of this course, it is expected that the student be able to:

- Identify the characteristics of the Muslim community
- Acquainted with the teachings of Islam in the area of family formation
- Acquainted with the teachings of Islam and guidance
- The concept of the Muslim community

Teaching Method

- Lectures

Expected Learning Outcomes:

-

Course Contents:

Unit 1	The concept of the Muslim community Rights in Islam The concept of an Islamic society
Unit II	Muslim community properties And means of strengthening social ties The most important social problems
Unit III	Family in Islam Introductions of marriage Marriage and his goals
Unit IV	The impact of the marriage contract And means of strengthening family ties The most important family issues
Unit V:	
Unit VI:	
Unit VII:	

Text Book (s): • Islam and society to Professor Hassan Abdul Ghani
Reference Book (s): • Islam and society, Dr. Ahmed Mohammed El-Assal • The assets of the social system in Islam, Dr. Muhammad Tahir Ashour
Mode of Evaluation: • Mid-Term Test-1 …….. (25 %) • Mid-Term Test-2 …….. (25 %) • Final Exam. …….. (50 %)

Course title	Linear Algebra	**Coordinator**			
Course code	329-Math-3	**Credits Hrs**	3	**Contact Hrs**	48
Prerequisites		**Level/Year**		5/3	

Course Objective :

Upon completing this course, it is expected that students will be able to:

- Understand and apply matrix and vector algebra, and relate matrices to linear transformations**.**
- Solve systems of linear equations using Gauss Elimination Methods
- Calculate the determinant of square matrices
- Perform basic matrix operations
- Determine whether the matrix is positive definite, negative definite or indefinite by finding Eigen values
- Understand and apply fundamental concepts of vector spaces such as span, linear independence, basis, and dimension**.**

Teaching Method

- Traditional class room , others

Expected Learning Outcomes:

CLO-1. Understand and apply matrix and vector algebra, and relate matrices to linear transformations.
CLO-2. Understand and Apply fundamental concepts of vector spaces such as span, linear independence, basis, and dimension**.**
CLO-3. Understand and apply matrix and vector algebra, and relate matrices to linear transformations.
CLO-4. Solve systems of linear equations using Gauss Elimination Methods
CLO-5. Calculate the determinant of square matrices
CLO-6. Perform basic matrix operations
CLO-7. Determine whether the matrix is positive definite, negative definite or indefinite by finding Eigen values
CLO-8. Understand and apply fundamental concepts of vector spaces such as span, linear independence, basis, and dimension.
CLO-9. work effectively in groups as well as individually
CLO-10. be aware of professional and ethical responsibilities
CLO-11. Capacity for self-directed learning.

Course Contents:

Email: engineering.kku.edu.sa
Website: www.engineering.kku.edu.sa/en
ص ب: 394 أبها 61411 ت: 017 241 8816 ف: 017 241 8184
P.O. Box 394 Abha 61411 Tel: +966 17 241 8816 Fax: +966 17 241 8184

Unit I:	Algebra of Matrices: Matrices, Matrix Addition and Scalar Multiplication, Matrix Multiplication, Transpose of a Matrix, Square Matrices, Diagonal and Trace, Powers of Matrices, Invertible (Non-singular) Matrices, - Cofactors and Inverses ,Diagonal and Triangular Matrices, Symmetric matrices.
Unit II:	Determinants: The definition of the determinant of a square matrix. The calculation of the determinant by cofactor expansion, the determinant by elementary operations. Properties of the determinant function. Inverse of Matrix.
Unit III:	Systems of Linear Equations: Basic Definitions, Equivalent Systems, Elementary Operations, Systems in Triangular, Gaussian elimination, Echelon Matrices, Row Canonical Form, Row Equivalence, Matrix Equation of a System of Linear equations - Homogeneous Systems of Linear equations, Cramer's rule.
Unit IV:	Vectors in Two and Three Dimensions: Algebraic Notation, The geometric Notation, The Standard Basis Vectors Parametric Equation of line, Symmetric Equation of Lines
Unit V:	The Dot Product: Dot Product of Two Vectors, Orthogonal Vectors, Angle Between Vectors, Vector Projections.
Unit VI:	The Cross Product: The Cross Product of Two Vectors in R^2 and R^3, Coordinate Formula, Areas and Volume Independence, Spanning Set and Basis - Coordinate and Dimension - Null Space, Row space and Column Space - Change of Basis
Unit VII:	Linear Transformations: Definition of Linear Transformations in R^2 and R^3, related Matrices to linear Transformations – Eigenvalues and Eigenvectors and their geometric meaning

Text Book (s):

- Howard, Anton, Chris Rorres, "Elementary Linear Algebra", ISBN 978-1-118-43441-3

Reference Book (s):

- S. Leon, "Linear Algebra with Applications", Pearson, 8th edition, 2008
- Shafarevich, Igor R., Remizov, Alexey ,"Linear Algebra and Geometry" 2013.

Mode of Evaluation:

- Mid-Term Test-1 …… (25 %)
- Mid-Term Test-2 …… (25 %)
- Final Exam. …… (50 %)

Course title	Technical Reports Writing	**Coordinator**			
Course code	301-NGL-2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites	012-ENG-6	**Level/Year**		5/3	

Course Objective

- To help develop communicative writing skills
- To enrich the understanding of the roles that writing and reading play in activities outside and inside the university.
- To offer a structured approach to writing.
- To familiarize students with the process of writing.
- To develop their grammar and mechanical writing skills.
- To enable students to write technical reports

Teaching Method:

- Classroom Lectures
- Interacting through E-learning.
- Large-and small-group discussion

Expected Learning Outcomes:

CLO-1. Developing the students' academic writing skills
CLO-2. Developing the students' academic critical reading skills
CLO-3. Enhancing students' team work skills by doing research tasks in groups or pairs
CLO-4. Raising students' awareness of the importance of original work and avoiding plagiarism
CLO-5. Developing students' skill of searching relevant online material
CLO-6. Selection of community problems as research topics.

Course Contents:

Unit I:	Part 1: Organization
	Part 2: Grammar & Mechanics
	Part 3: Sentence Structure
	Part 4: The Writing Process
Unit II:	Prewriting Brainstorming Part 1: Organization
	Part 2: Sentence Structure
	Part 3: Grammar & Mechanics
	Part 4: The Writing Process
Unit III:	Prewriting Descriptive Details Part 1 Organization
	Part 2 Grammar & Mechanics

	Part 3 Sentence Structure
	Part 4 The Writing Process
Unit IV:	Prewriting Part 1 Organization
	Part 2 Sentence Structure
	Part 3 Sentence Structure
	Part 4 The Writing Process
	Part 4 The Writing Process

Text Book (s):

- McCarthy, Michael. Touchstone (1) Student's Book. Dubai: Cambridge and Obeikan, 2009
- McCarthy, Michael. Touchstone (1) Work Book. Dubai: Cambridge and Obeikan, 2009
- Blackwell, Angela. Open Forum (1) Academic Listening and Speaking. Oxford: Oxford University Press, 2007.

Reference Book (s):

- Blass, Laurie. Well Read (1). Oxford: Oxford University Press, 2008.

Mode of Evaluation:

- Mid-1 Exam……(15%)
- Mid-2 Exam……(15%)
- Homework and Quiz……(20%)
- Final Exam……(50%)

Course title	Theory of machine	**Coordinator**			
Course code	321-ME-3	**Credits Hrs**	3	**Contact Hrs**	4
Prerequisites	212-ME-3 313-ME-3	**Level/Year**		6/3	

Course Objective

This course covers and concentrates on the theory, design, performance, and principles of the Kinematics and Kinetics of rigid bodies, which deal with motion; position; velocity and acceleration. The course also includes cams, governors, balancing and their applications. Theory of machines is a core mechanical engineering subject and a prerequisite for machine design.

Teaching Method

- Lectures
- Videos
- Discussion
- Self-learning
- Tutorial sheets
- Practical

Expected Learning Outcomes:

CLO-1. Define the basic concepts of machines and mechanisms.
CLO-2. State safety measures to be incorporated in CAM Design
CLO-3. Design velocity and acceleration diagrams of basic mechanisms
CLO-4. Develop the displacement diagram and cam profile.
CLO-5. Compare different types of Gears and Gear Trains and solve design problems
CLO-6. Explain the functions, types and characteristics of governors and solve numerical problems

Course Contents:

Unit I:	Introduction
Unit II:	Definition of Mechanisms and Machines
Unit III:	Displacement Analysis of Mechanisms
Unit IV:	Velocity Analysis of Mechanisms

Unit V:	Acceleration Analysis of Mechanisms
Unit VI:	Cam Design
Unit VII:	Gear train Theory
Unit VIII:	Balancing of rotating masses
Unit IX:	Governors

Text Book (s):

- Theory of Machines by RS Khurmi and JK Gupta; S. Chand and Company Ltd., New Delhi.
- Theory of Machines; SS Rattan: Tata McGraw Hill, New Delhi.
- J. E. Shigley, J.J. Uicker, Theory of machines and mechanisms.
- Mechanism and Machine Theory; J S Rao and Dukkipati; Wiley Eastern, New Delhi.
- Theory of Mechanism and Machine; A Ghosh and AK Malik, East West Press (Pvt.) Ltd., New Delhi.

Reference Book (s):

-

Mode of Evaluation:

- Mid-1 Exam……(15%)
- Mid-2 Exam……(15%)
- Assignment and Quiz……(10%)
- Practical report……(5%)
- Final practical exam……(5%)
- Final Exam……(50%)

Course title	Fluid mechanics	**Coordinator**			
Course code	322-ME-3	**Credits Hrs**	**3**	**Contact Hrs**	2
Prerequisites	222- ME-3	**Level/Year**		6/3	

Course Objective

- Understand and differentiate between different types of Fluid and recognize the application of dimensions and units
- Compute the viscous forces in various engineering applications as fluids deform and the ability to conduct experiments.
- Recognizing the fundamental principles, mathematical laws of fluid statics and dynamics. and recognizing head losses and flow characteristics in simple pipes
- Determine the variation of pressure in a fluid at rest and calculate the forces exerted by a fluid at rest on a plane or curved submerged surfaces
- Compute the effect of buoyancy on submerged and floating bodies and the ability to conduct experiments
- Identify the various types of flow and calculating velocity and acceleration
- Apply the mass conservation equation in a flow system
- Determine the various kinds of forces and moments acting on a fluid flow field
- Utilize the Bernoulli equation to solve fluid flow problems and recognize its limits.
- Apply the method of repeating variables(Bucking ham's theorem) to identify non–dimensional parameters
- Work independently and as a part of a team to calculate the major and minor losses in energy associated with pipe flow system

Teaching Method

- Classroom
- Practical classes
- Discussions

Expected Learning Outcomes:

CLO-1. Describe different types of Fluids and recognize the application of dimensions and units
CLO-2. Recognize the fundamental principles, mathematical laws of fluid statics and dynamics. recognizing head losses and flow characteristics in simple pipes
CLO-3. Estimate the viscous forces in various engineering applications as fluids deform
CLO-4. Interpret the variation of pressure in a fluid at rest
CLO-5. Calculate the forces exerted by a fluid at rest on a plane or curved submerged surfaces
CLO-6. Compute the effect of buoyancy on submerged and floating bodies and the

ability to conduct experiments
CLO-7. Apply the mass conservation equation in a flow system
CLO-8. Compare various kinds of forces and moments acting on a fluid flow field
CLO-9. Illustrate independently and as a part of a team minor losses in energy associated with pipe flow system
CLO-10. Question the results and work of others
CLO-11. Operate internet in searching and learning
CLO-12. Illustrate skills in using computational tools

Course Contents:

Unit I:	Introduction
Unit II:	Fluid definition -Dimensions and units
Unit III:	Fluid properties
Unit IV:	Fluid Statics:
Unit V:	Buoyancy and Stability of floating body
Unit VI:	Fluid Kinematics
Unit VII:	Fluid Dynamics
Unit IX:	Energy Principles

Text Book (s):

- Clayton T. Crowe , Donald F. Elger and John A. Roberson, Engineering Fluid Mechanics", John Wiley& Sons, Inc., 8th Ed., 2006

Reference Book (s):

- Robert W. Fox, Alan T. McDonald and Philip J. Pritchard " Introduction to Fluid Mechanics

Mode of Evaluation:

- Class activities (quizzes and homework).....(10%)
- Major exam I.....(15%)
- Major exam II.....(15%)
- Practical Exam.....(10%)
- Final Exam.....(50%)

Course title	Electric Engineering-2	**Coordinator**			
Course code	328 -EE-3	**Credits Hrs**	3	**Contact Hrs**	4
Prerequisites		**Level/Year**		6/3	

Course Objective

The course aims to introduce the construction and basic concepts of the electrical machines, the theory of operation, the equivalent circuits, the defining equations, and the steady state characteristics of: single phase transformers, three phase induction motors , three phase synchronous machine and DC machines

Teaching Method

- Lectures
- Discussion
- Self-learning
- Tutorial sheets

Expected Learning Outcomes:

CLO-1. Know the construction, equivalent circuits, steady state equations, and steady state characteristics of DC machines.
CLO-2. Understand the construction, equivalent circuits, steady state equations, and steady state characteristics of single-phase transformer.
CLO-3. Practice the construction, equivalent circuits, steady state equations, and steady state characteristics of three-phase induction motors.
CLO-4. Understand the construction, equivalent circuits, steady state equations, and steady state characteristics of three-phase synchronous machine.
CLO-5. Use AC Machines practically, their operating and control characteristics,
CLO-6. Investigate the steady state characteristics of all the electrical machines through experimental work.

Course Contents:

Unit I: **Magnetic Circuits.**	Definitions of terms. -The concept of magnetic circuit. - Magnetic circuits in series. -Magnetic circuits in parallel .
Unit II: Single phase transformer	Construction of single-phase transformers- ideal transformer - equivalent circuit of transformer- percentage voltage regulation - determination of equivalent circuit parameters.

Unit III: Three-Phase Induction Motor	Constructional feature. - Rotating magnetic field - Equivalent circuit of 3-phase induction motor- Torque and, power
Unit IV: Three-Phase Alternators	Constructional feature. - Rotating magnetic field - Equivalent circuit of 3-phase induction motor - Power equation - The concept of infinite bus - The power angle characteristics. - The power-frequency control
Unit V: Direct current Machines	Constructional feature- modeling of D.C. machines; phasor diagram of cylindrical rotor and salient pole machines- - DC generators - DC motors

Text Book (s):

- Theodore Wildi, "Electric Machines, Drives and Power Systems", Prentice Hall, most recent edition
- R. K. Rajput, Electrical Machines, 3rd Ed., Laxmi Publications (P) Ltd., 2003

Reference Book (s):

- E. Fitzgerald, Charles Kingsley, Jr. Stephen D. Umans, "ELECTRIC MACHINARY", McGraw Hill, Sixth Edition.
- S. Chapman, Electric Machinery Fundamentals, 4th Ed., McGraw-Hill, 2003.
- L. Kosow, Electrical Machinery and Transformers, 2nd Ed., Prentice- Hall of India Pvt. Ltd., 2003.

Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work, Quizzes and Assignments …….. (20 %)
- Final Exam. …….. (50 %)

Course title	Numerical Methods	**Coordinator**			
Course code	419- Math -3	**Credits Hrs**	3	**Contact Hrs**	4
Prerequisites	319-MATH- 3	**Level/Year**		6/3	

Course Objective :

Upon completing this course, it is expected that students will be able to:

- Solve mathematical problems difficult to solve analytically as finding the roots of equations and computing the integrals.
- Use direct and iterative methods for solving systems of linear equations.
- Use interpolation and least squares for Data modeling.
- Analyze the approximation error.
- Use MATLAB for the numerical algorithms.

Teaching Method

- Traditional class room
- Blended

Expected Learning Outcomes:

CLO-1. Computer arithmetic, error analysis; solving nonlinear equations in one variable; direct and iterative methods for solving linear systems; interpolation and polynomial approximation, cubic spline interpolation; least squares approximation; numerical differentiation and integration
CLO-2. Ability to differentiate between analytical solutions and (approximate) numerical solutions
CLO-3. Ability to choose and use different numerical methods.
CLO-4. Error analysis of numerical methods.
CLO-5. Ability to write and implement algorithms to solve different numerical issues.
CLO-6. Discussions; Work in a team; Time management; Self-reliance
CLO-7. Ability to discuss and compare results.
CLO-8. Ability to handle ICT issues (Math's programs, net, etc. ...).
CLO-9. Ability to use the e-learning at the support level.
CLO-10. Ability to write and implement algorithms of numerical methods

Course Contents:

Unit I:	Numerical methods to solve nonlinear equations: Bisection method, fixed-point method, Newton method, approximation and error analysis.
Unit II:	System of nonlinear equations: Newton method
Unit III:	System of linear equation: Direct methods: Gauss elimination, partial pivoting. Iterative methods: Jacobi method, Gauss-Seidal method, error analysis.
Unit IV:	Functions' interpolation and approximation: Polynomial approximations: exact, missing and experimental data. Finite differences, Lagrange interpolation, Newton formula, best approximation, error analysis. Cubic splines interpolation: Natural cubic splines.
Unit V:	Numerical integration: Using closed Newton's cotes formula (Trapezoidal and Simpson's rules). Numerical differentiation: First derivatives, forward, backward and central difference, Second derivative approximation, central difference.
Unit VI:	Ordinary Differential Equations: Euler method,Runge-Kutta Methods (of 4th order), Boundary-Value and Eigenvalue Problems..
Unit VII:	Numerical Solutions to Partial Differential Equations: Elliptic Partial Differential Equations, example: Poisson Equation Finite-Difference.

Text Book (s):

- Numerical Methods S.R.K. Iyengar, R.K. Jain, Published by New Age International (P) Ltd., Publishers, 2009.

Reference Book (s):

- Numerical Analysis, by Richard L. Burden and J. Douglas Faires, 9th ed. Brooks/Cole, 2011.
- Numerical Methods, Rao V. Dukkipati, New Age International (P) Ltd., Publishers, 2010
- Elementary Numerical Analysis, 3rd edition, Atkinson, Han, John Wiley & Sons, Inc., 2004
- Numerical Methods for Engineers, 7th Edition by Steven C. Chapra and Raymond P. Canale, McGraw-Hill, 2014.

Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (40 %)
- Assignments ……..…….. (10 %)
- Final Exam. ……..…….. (50 %)

Course title	Principles of Statistics and Probability	**Coordinator**			
Course code	329- Stat -2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites		**Level/Year**		6/3	

Course Objective :

Upon completing this course, it is expected that students will be able to:

- Recognize presentation of data (grouped and ungrouped data).
- Understand the summation notation.
- Should know how to find the arithmetic mean, the coding method for computing mean, the weighted mean. The median. The mode. The geometric mean. The harmonic mean. Quartiles, Deciles and Percentiles.
- Recognize random experiment, sample space, events, and operations on the events, axioms of probability, assignment of probability, random variables and probability distribution. Extract the mean, the variance and the standard deviation of the random variables

Teaching Method

- Traditional class room
- blended
- e-learning

Expected Learning Outcomes:

CLO-1. By the end of the course, student should be able to read statistical data (tabular or graphical), understand and calculate measures of central tendency, measures of dispersions, correlation and regression and understand basic concepts of probability..
CLO-2. Ability to understand difference between different measure of data
CLO-3. Use of theorems to understand different variation of properties of data
CLO-4. Distinguish the reasons for using different methods to calculate correlation

Course Contents:

Unit I:	Data presentation
Unit II:	Measures of central tendency
Unit III:	Measures of Dispersion

Unit IV:	Correlation Coefficient and Regression Line
Unit V:	Principles of Probability Theory
Unit VI:	Statistical Inference

Text Book (s):

- Work out statistics for Advanced level (Ball. A. and Buckwell, G.)

Reference Book (s):

- Elementary Statistics, A Step by Step Approach.
- Probability and Statistics by Dr Adnan and Dr Mahmoud Hindi (Arabic)

Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (40 %)
- Assignments …….. (10 %)
- Final Exam. …….. (50 %)

Course title	Islamic Culture -4	**Coordinator**			
Course code	114IC1-2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites	-	**Level/Year**		6/3	

Course Objective

After the completion of this course, it is expected that the student be able to:

- Identify intellectual invasion of the Islamic world methods
- Understanding the contemporary Muslim world challenges
- Prevention of destructive ideologies

Teaching Method

- Lectures & E Learning classes
- Dialogues and Discussion
- Self-Learning

Expected Learning Outcomes:

- Enable student to write according to writing rules
- Learn the techniques of Arabic writing

Course Contents:

Unit 1	Colonization Secularism National
Unit II	Christianization Orientalism Freemasonry
Unit III	Zionism Globalization Cognitive and technical challenge
Unit IV	Economic challenge Political challenge Unit Muslim world Economic development
Unit V:	

Unit VI:	

Text Book (s):

- Methods of intellectual invasion, Dr. Ali Abu Gereshsa
- Secular, Dr. Mohamed Kotb.

Reference Book (s):

- Critique of Arab nationalism, Sheikh bin Baz
- Orientalism and the intellectual background of the conflict of civilization, Dr. Mahmoud Zaqzouq

Mode of Evaluation:

- Mid-Term Test-1 …….. (25 %)
- Mid-Term Test-2 …….. (25 %)
- Final Exam. …….. (50 %)

Course title	Summer Internship	**Coordinator**			
Course code	400-ME-0	**Credits Hrs**	0	**Contact Hrs**	0
Prerequisites	After Completion of 95 credit hours	**Level/Year**		3rd Year Summer	

Course Objective

- Summer training program (400ME-0) is a complementary course for students who complete their courses up to level six according to the study plan. This course is for a period of six weeks and is mandatory for a graduation requirement. Students are directed to companies and factories according to their wishes. This course is mainly self-learning and final evaluation is made by the department committee.

- The summer training is a practical internship in a professional engineering setting. This setting can be a company, a government institution, research Centre, clinic, etc. as deemed appropriate. Students are expected to be enthusiastic and self-motivated to learn various aspects of the organizations, create targets and specifications, and design components for a mutual benefit. The training is principally assessed based on defined engineering work. The technical activity should be related to both the student's engineering studies and to the host's activities, and it should constitute a significant body of engineering work at the appropriate level. It should involve tasks and methods that are more appropriately completed in a professional engineering environment. A state of the art training report at the end of the course is a valuable deliverable leading to an enhanced industry-academic collaboration.

Teaching Method

- Reflective diary (weekly report)
- Goals report
- Midway report
- Final report
- Presentations/viva

Expected Learning Outcomes:

CLO-1. To gain practical experience and training before graduation.
CLO-2. To Use of industrial enterprises with information on the quality of human resources that contributes to the industry in the future.
CLO-3. To apply practical experience after the training period
CLO-4. Evaluate the students understanding of theoretical experience by

engaging them with the real practical life. CLO-5. Enhance students' abilities to take responsibility and punctuality CLO-6. Improve students' abilities to deal with members of the community outside the university. CLO-7. Develop students' abilities to respect others and listen to their views and practical applications of leadership	
Course Contents:	
Unit I:	
Unit II:	
Unit III:	
Unit IV:	
Unit V:	
Unit VI:	
Unit VII:	
Text Book (s):	
Reference Book (s):	
Mode of Evaluation: • Reflective diary.....5% • Goals report.....10% • Midway report.....20% • Final report.....50% • Presentations/viva.....15%	

Course Syllabi and Description
for
Fourth Year

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Course title	Machine Elements Design	**Coordinator**			
Course code	411-ME-3	**Credits Hrs**	3	**Contact Hrs**	2
Prerequisites	223-ME-3 312-ME-3	**Level/Year**		7/4	

Course Objective

- Recognize the difference between theory and the applied design.
- Know different design theories and their applications.
- Analyze forces and calculate principal stresses.
- Acquire skills in designing simple machine parts.
- Acquire skills in using computer in design and drawing

Teaching Method

- Lectures,
- Tutorial,
- Reports

Expected Learning Outcomes:

CLO-1. Recognize the difference between theory and the applied design
CLO-2. Define different design theories and their applications
CLO-3. Analyze forces and calculate principal stresses
CLO-4. Demonstrate skills in designing simple machine parts
CLO-5. Illustrate skills in using computer in design and drawing

Course Contents:

Unit I:	Introduction to design processes, types of stresses, and material selection
Unit II:	Failure theories: static and dynamic.
Unit III:	Design of joints: riveted, welded, screwed, and cotter and knuckle joints
Unit IV:	Couplings design: rigid and flexible
Unit V:	Clutches design.
Unit VI:	Brakes design
Unit VII:	Springs design

Unit VII:	Chain drives
Unit IX:	Power screws design
Unit X:	Computer Aided design using Solidworks

Text Book (s):

- Khurmi, R.S. & Gupta, J.K., "Machine Design", Eurasia Publishing House, Last Edition.
- Shigley, J.E., "Mechanical Engineering Design", McGraw Hill, Inc., Last Edition

Reference Book (s):

- Robert C. Juvinall & Kurt M. Marshek, "Fundamentals of Machine Components Design", 5th Edition, John Wiley & Sons Inc., 2012, ISBN 9781118012895.
- Robert L. Mott, "Machine Elements in Mechanical Design", 3rd Edition, Prentice Hall, 1999.
- Avallone, E.A., Baumeister, T., "Marks Standard Handbook for Mechanical Engineers", 11th Edition, McGraw Hill, 2007.

Mode of Evaluation:

- Tutorials and Assignments.....(10%)
- Quiz.....(10%)
- Mid-Term test 1.....(15%)
- Mid-Term test 2.....(15%)
- Final exam.....(50%)

Course title	Metal Forming Processes	**Coordinator**			
Course code	412-ME-3	**Credits Hrs**	3	**Contact Hrs**	4
Prerequisites	221-ME-3 211-ME-3	**Level/Year**		7/4	

Course Objective

- Summarize the principles of the material forming properties such as fusibility, plasticity, and ductility and the processes depending on them.
- Acquire the skills about the procedures of the casting process especially the sand casting.
- Identify the attitudes of permanent metal joining processes such as welding techniques.
- Acquire the information about the different methods of plastic deformation operations.
- Recognize the technology of the sheet metal working processes.

Teaching Method

- Classroom
- Practical Classes

Expected Learning Outcomes:

CLO-1. State the principles of the material forming properties such as fusibility, plasticity, and ductility and the processes depending on them.
CLO-2. Use all forming techniques in the proper way
CLO-3. Develop a logical work plan for a particular forming job
CLO-4. Analyze the expected defects in welding and casting
CLO-5. Research on the internet to get the technical data.

Course Contents:

Unit I:	General Introduction about material fabrication techniques Introduction to casting technology. Different casting techniques. Melding materials and their properties. Sand casting technology. Sands used in casting. Patterns and cores fabrication.
Unit II:	Different melting furnaces used in casting. Solidification of pure metals and alloys
Unit III:	Different casting defects. Quality control in sand casting. Permanent die casting Investment casting. Continuous casting.

Unit IV:	Introduction to plastic deformation processes. Extrusion process of metals.
Unit V:	Forging of metals
Unit VI:	Rolling process of metals

Text Book (s):

- Kalpakjian, S & Schmid, S. R., "Manufacturing Engineering and Technology", 5th Edition, 2005.

Reference Book (s):

- Serope Kalpakjian & Steven R. Schmid, "Manufacturing Engineering and Technology", any edition (Fourth edition to the newest one: 2001 to 2008), Prentice Hall.
- ASM Handbook, "Forming and Forging "Volume 14, 1988, Metals--Handbooks, manuals, etc. 1. ASM International. Handbook Committee, SAN 204-7586
- ASM Handbook, "Casting" Volume 15, 1988, Metals--Handbooks, manuals, etc. 1. ASM International. Handbook Committee, SAN 204-7586.

Mode of Evaluation:

- Assignments……(5%)
- Homework……(10%)
- Midterm- 1……(10%)
- Midterm- 2……(15%)
- Final experimental exam ……(10%)
- Final exam……(50%)

Course title	Heat Transfer	**Coordinator**			
Course code	413-ME-3	**Credits Hrs**	3	**Contact Hrs**	4
Prerequisites	322-ME-3	**Level/Year**		7/4	

Course Objective

- Identify the concepts of heat transfer
- Estimate the principles of heat transfer modes
- Calculate steady-state 1-D basic heat conduction problems
- Monitor unsteady basic heat conduction problems with lumped capacitance method
- Familiarize students with basic heat transfer problems of forced convection inside ducts.
- Develop and enhance the student's mentality

Teaching Method

- Lecture
- Discussion
- Solving problems
- Lab demonstrations

Expected Learning Outcomes:

CLO-1. Outline the concepts of heat transfer.
CLO-2. Develop the modes heat transfer & electric circuits
CLO-3. Analyze the free convection and forced convection.
CLO-4. Design heat Exchangers

Course Contents:

Unit I:	Introduction to Heat Transfer.
Unit II:	Modes of Heat Transfer & Electric Circuits.
Unit III:	Steady State Conduction.
Unit IV:	Fins & Extended Surfaces
Unit V:	Unsteady State Conduction

Unit VI:	Free Convection.
Unit VII:	Forced Convection.
Unit IX:	Radiation
Unit X:	Heat Exchangers

Text Book (s):

- Thomas, L.C "Heat Transfer", Professional Version, 2nd ed. Capstone Pub. Corp., 1999.
- Incropera, F. De Witt, D. P., "Introduction to Heat Transfer", John – Wiley and Sons, 2006.

Reference Book (s):

- Thomas, L.C "Heat Transfer", Professional Version, 2nd ed. Capstone Pub. Corp., 1999.
- Incropera, F. De Witt, D., P., "Introduction to Heat Transfer", John – Wiley and Sons, 2006.

Mode of Evaluation:

- Homework and Quizzes……(15%)
- Midterm exam 1……(10%)
- Midterm exam 2……(15%)
- Practical exam……(10%)
- Final exam……(50%)

Course title	Measuring Devices	**Coordinator**			
Course code	414-ME-2	**Credits Hrs**	2	**Contact Hrs**	3
Prerequisites	321-ME-3	**Level/Year**		7/4	

Course Objective

- Understand the basic principles and elements of measurement system and usage of measurement device usage.
- Know the different measurement techniques in the mechanical engineering stream.
- Acquire the skills and trouble shooting of the different measuring devices in the mechanical engineering field.
- Analyze the measurement data using uncertainty analysis; propagation of individual uncertainties to final measurement and expression of results.
- Have strong awareness about computer assisted data acquisition, data manipulation, data presentation.

Teaching Method

- Lectures,
- Lab Exercise,
- Class Discussions

Expected Learning Outcomes:

CLO-1. Define basic principles and elements of measurement system and usage of measurement device usage
CLO-2. Justify the awareness about the principles of measurement
CLO-3. Calculate (directly or indirectly) correctly by hand or by using a computer program in
CLO-4. measurements of temperature, fluid properties, flow measurement
CLO-5. Analyze measurement data sets correctly using statistical concepts especially during the coverage of errors and uncertainty in measurements.
CLO-6. Plan safe and logical lab procedures
CLO-7. appraise independent learning by assigning time bound assignments/seminars/discussions

Course Contents:

Unit I:	Introduction to Mechanical Measurements

Unit II:	Terminology in Mechanical measurements
Unit III:	Accuracy, Precision and Significant Digits
Unit IV:	Errors in Measurement-Classification of Errors
Unit V:	Uncertainty analysis-Numerical Problems
Unit VI:	Data analysis, presentation, and written report
Unit VII:	Temperature Measurement
Unit VIII:	Pressure measurement
Unit IX:	Measurement of fluid properties
Unit X:	Flow measurement

Text Book (s):

- Thomas G. Beckwith, Roy D. Marangoni, John H. Lienhard V "Mechanical Measurements (6th Edition) 6th Edition, PEARSON-Prentice Hall

Reference Book (s):

Mode of Evaluation:

- Midterm Exam 1 Theory……(15%)
- Midterm Exam 2 Theory……(15%)
- Final Practical Exam……(10%)
- Theory Assignments and Quizzes……(5%)
- Practical Assignments and Quizzes……(5%)
- Final Exam……(50%)

Course title	Professional Ethics and Practice	**Coordinator**			
Course code	411-GE-2	**Credits Hrs**	**2**	**Contact Hrs**	2
Prerequisites	NIL	**Level/Year**		7/4	

Course Objective

The overall aim of this course is to introduce the concepts, theory and practice of engineering professionalism and ethics. It will allow to understand the moral problems faced in the corporate setting and wider philosophical frameworks along with social importance and their intellectual challenges are given its due placement. It is important that students have to be not only technically competent, but socially accountable in their careers. Hence, this course expect them to learn to share ideas and concepts, working in teams on majority of the case studies to have enough sensitivity to engineering professionalism.

Teaching Method

- Lectures,
- Tutorials,
- Discussion,
- Self-learning,
- Assignments and Quizzes

Expected Learning Outcomes:

CLO-1. Define how societal morals vary with culture and how this influences ethical thought and action.

CLO-2. Outline duties and responsibilities as professionals through gaining knowledge of the philosophies of ethics, professional practice, and world culture.

CLO-3. Demonstrate written communication skills with regard to ethical and professional issues in practical engineering applications.

CLO-4. Illustrate oral communication skills with regard to ethical and professional issues in practical engineering applications.

Course Contents:

Unit I:	Engineering Ethics Engineering Ethics, Variety of moral issues, Types of inquiry, Moral dilemmas, Moral Autonomy, Kohlberg's theory, Gilligan's theory, Consensus and Controversy, Professions and Professionalism, Professional Ideals and Virtues, Uses of Ethical Theories

Unit II:	Engineering as Social Experimentation Experimentation, Engineers as responsible Experimenters, Research Ethics, Codes of Ethics, Industrial Standards, A Balanced Outlook on Law, The Challenger Case Study
Unit III:	Engineer's Responsibility for Safety Safety and Risk, Assessment of Safety and Risk, Risk Benefit Analysis, Reducing Risk, Case Studies
Unit IV:	Responsibilities and Rights Saudi Laws and professional behavior ,Collegiality and Loyalty, Respect for Authority, Collective Bargaining, Confidentiality, Conflicts of Interest, Occupational Crime, Professional Rights, Employee Rights, Intellectual Property Rights (IPR), Discrimination
Unit V:	Global Issues Multinational Corporations, Business Ethics, Environmental Ethics, Computer and Internet Ethics, Role in Technological Development, Weapons Development, Engineers as Managers, Consulting Engineers, Engineers as Expert Witnesses and Advisors, Honesty, Moral Leadership, Sample Code of Conduct (IEE, NSPE, ABET etc.)
Unit VI:	Practices in Saudi Arabia and compares them with international practices.

Text Book (s):

- Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 2005.

Reference Book (s):

- Harris Jr., C.E. , Pritchard, M.S., Rabins, M.J., Engineering Ethics Concept and Cases: 4th edition (California: Wadsworth Cengage Learning, 2009)
- L.H. Newton & Catherine K.D. – Classic cases in Environmental Ethics, Belmont: California Wadsworth, 2006
- Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Thompson Learning, 2000.

Mode of Evaluation:

- Seminars ……(10%)
- Case Studies……(10%)
- Midterm- 1……(15%)
- Midterm- 2……(15%)
- Final exam……(50%)

Course title	Machine Design	**Coordinator**			
Course code	421-ME-3	**Credits Hrs**	**3**	**Contact Hrs**	4
Prerequisites	411-ME-3	**Level/Year**		8/4	

Course Objective

This course is devoted to study the power transmission systems and analyze the stresses on each machine element in the transmission line. The course also deals with the selection of the right power source to drive such systems and the design of shafts, keys, belts, gears and bearings and all other elements involved with the transmission line.

Teaching Method

- Lectures,
- Tutorials,
- E-learning,
- Computer Simulation

Expected Learning Outcomes:

CLO-1. Define the main principle of stress analysis.
CLO-2. Identify the machine elements in the power transmission systems.
CLO-3. List the different Types roller bearings.
CLO-4. Evaluate the power and torque for the power transmission systems.
CLO-5. Compare between the journal and roller bearings.
CLO-6. Analyze the performance of the power transmission system.
CLO-7. Demonstrate the various types of forces applied on the gear
CLO-8. Interpret Technical reports
CLO-9. Demonstrate simulation programs.

Course Contents:

Unit I:	Stress strain analyses
Unit II:	Design of shafts & keys
Unit III:	Design of Belts &chains
Unit IV:	Design of bearings
Unit V:	Study the different types of gear boxes
Unit VI:	Design of single reduction gear box

Text Book (s):

- Sheigley, Mechanical Engineering design book 3rd edition 2012.

Reference Book (s): Nil

Mode of Evaluation:

- Quizzes ……(5%)
- Assignments……..(5%)
- Midterm- 1……..(15%)
- Midterm- 2……..(15%)
- Lab Report……..(10%)
- Final exam……..(50%)

Course title	Thermodynamics – 2	**Coordinator**			
Course code	422-ME-3	**Credits Hrs**	**3**	**Contact Hrs**	4
Prerequisites	223-ME-3	**Level/Year**		8/4	

Course Objective

This course deals with first and second laws of thermodynamics, power systems with phase change (Concepts of vapor power cycles and their applications: Rankine cycle for vapor power plants, Reheat cycle, and Regenerative cycle, refrigeration systems with phase change (Concepts of refrigeration cycles and their applications, refrigerators and heat pumps), power systems with working gaseous fluids (Concepts of gas power cycles and their applications: Otto cycle, Diesel cycle, Brayton cycle, and Jet-propulsion cycles, gas mixtures (Composition of a gas mixture. P-v-T behavior of gas mixtures. Thermodynamic properties of gas mixtures), and chemical reactions (fuels and combustion and their applications, theoretical and actual combustion processes, enthalpy of formation and enthalpy of combustion. steady-flow and closed reacting systems.

Teaching Method

- Lectures
- Assignments
- Student Presentations
- Reports

Expected Learning Outcomes:

CLO-1. Describe the power and refrigeration cycles
CLO-2. Outline the gas mixtures
CLO-3. Apply the thermodynamic relations, generally and for simple compressible substances specifically.
CLO-4. Apply the basics, physical concepts and practical applications of gas mixtures
CLO-5. Use psychometrics to solve thermodynamic problems
CLO-6. Design refrigeration power systems
CLO-7. Compare the fuels and combustion processes in thermodynamic systems
CLO-8. Demonstrate physical concepts and practical applications of gas mixtures
CLO-9. Analyze the thermodynamics problems and justify the choose of this way to have the solution
CLO-10. Evaluate combustion processes in thermodynamic systems
CLO-11. Demonstrate the need for energy conservation and its optimal use
CLO-12. Research on the internet for course related issues

CLO-13. Illustrate technical report	
Course Contents:	
Unit I:	First and second laws of thermodynamics.
Unit II:	Power systems with phase change (Concepts of vapor power cycles and their applications: Rankine cycle for vapor power plants, Reheat cycle, and Regenerative cycle. Lab experiment: Steam turbine).
Unit III:	Refrigeration systems with phase change (Concepts of refrigeration cycles and their applications: Refrigerators and heat pumps, vapor-compression refrigeration cycle. Selection of the right refrigerant. Heat pump systems. Lab experiment: Heat pump and Industrial refrigeration system).
Unit IV:	Power systems with working gaseous fluids (Concepts of gas power cycles and their applications: Otto cycle, Diesel cycle, Brayton cycle, and Jet-propulsion cycles. Lab experiment: Gas turbine and two-stage compressor).
Unit V:	Refrigeration systems with working gaseous fluids (The air-standard refrigeration).
Unit VI:	Thermodynamic relations (Maxwell relations, Gibbs equation, Clapeyron equation, Clapeyron-Clausius equation, General relations for the variation of enthalpy, internal energy and entropy and specific heat, Joule-Thomson Coefficient).
Unit VII:	Gas mixtures (Composition of a gas mixture. P-v-T behavior of gas mixtures. Thermodynamic properties of gas mixtures).
Unit VIII:	Gas-vapor mixtures and air-conditioning (Dry and atmospheric air-Specific and relative humidity of air-Dew-point and wet-bulb temperatures. The psychrometric chart. Air-conditioning processes. Lab experiment: Cooling tower).
Unit IX:	Chemical reactions (Fuels and combustion and their applications. Theoretical and actual combustion processes. Enthalpy of formation and enthalpy of combustion. Steady-flow and closed reacting systems. First law analysis of reacting systems. Adiabatic flame temperature)
Text Book (s): • Richard E., Sonntag, Claus.B. and Gordon J.Van,John. Fundamentals of Thermodynamics. Wiley&Sons, 2002. • Textbook of thermodynamic, New York, JOHN WILEY &SONS,Inc.	
Reference Book (s):	

- Richard E. Sonntag, "Fundamentals of Thermodynamics, 2004.
- Engineering thermodynamics, 2010, Tarik Al Shemmeri & Ventus publishing ApSISBN 976 – 87 -7681- 670 -4

Mode of Evaluation:

- Quizzes and Assignments ……..……..(10%)
- Midterm- 1……..(15%)
- Midterm- 2……..(15%)
- Practical Exam……..(10%)
- Final exam……..(50%)

Course title	Hydraulic Machines and Fluid Power Systems	**Coordinator**			
Course code	423-ME -3	**Credits Hrs**	**3**	**Contact Hrs**	4
Prerequisites	322-ME-3 Fluid Mechanics	**Level/Year**		8/4	

Course Objective

Upon completing this course, it is expected that the students will be able to:

- Specify the different types and applications of hydraulic machines.
- Differentiate between impulse and reaction turbines.
- Specify the different types and applications of pumps.
- Evaluate the performance of pumps and turbines by determining hydraulic, volumetric, mechanical, and overall efficiencies.
- Determine system head losses through a system.
- Identify how to connect pumps in series and parallel.
- Specify the basic components of fluid power system, such as pumps, actuator, valves, filters, and reservoirs.
- Describe the types of hydraulic valves.
- Describe the construction and design features of hydraulic cylinders.
- Analyze the operation and performance of hydraulic circuits.

Teaching Method

- Lectures
- Discussion
- Laboratory Experiments

Expected Learning Outcomes:

CLO-1. Describe the hydraulic machines according to the fluid energy and select the suitable type of hydraulic turbines and pumps
CLO-2. Describe the hydraulic valves and their use
CLO-3. Differentiate hydraulic machines according to application
CLO-4. Apply energy equation on the hydraulic machines
CLO-5. Predict the operating point of the pump
CLO-6. Estimate the errors in hydraulic circuits
CLO-7. Calculate the required pressure and flow rate for a specific application

Course Contents:

Unit I:	Introduction to Hydraulic Machines
Unit II:	Pelton Turbines

Unit III:	Francis & Kaplan Turbines
Unit IV:	Centrifugal Pumps
Unit V:	Cavitation in Pumps
Unit VI:	Pumps Connection and selection
Unit VII:	Introduction to fluid Power systems
Unit VIII:	Hydraulic Pumps(Positive displacement pumps)
Unit IX:	Hydraulic Valves
Unit X:	Hydraulic Cylinders and Tanks
Unit XI:	Examples of Hydraulic circuits

Text Book (s):

- Krivchenko, G. "Hydraulic Machines : Turbines and pumps", CRC Press, London, Latest edition.
- Esposito, A., " Fluid Power with Application", 6th edition. Prentice Hall Inc., 2002

Reference Book (s):

- Dixon, S.L., " Fluid Mechanics and Thermodynamics of Turbomachinery", 5th edition. Butterworth, Heinrmann, 2005.
- Pinches, M. J. & Ashby, J. G., " Power Hydrulics" , Prentice Hall, Latest edition.

Mode of Evaluation:

- Quiz and Assignments. ……(10%)
- Midterm- 1……..(15%)
- Midterm- 2……..(15%)
- Lab exam, report and oral exam……..(10%)
- Final exam……..(50%)

Course title	System Dynamics and Mechanical Vibrations	**Coordinator**			
Course code	424-ME-3	**Credits Hrs**	**3**	**Contact Hrs**	4
Prerequisites	321- ME 319- Math-3	**Level/Year**		8/4	

Course Objective

This course deals with mathematical modeling, response analyses and simulation of dynamic systems. These include mechanical, electrical, pneumatic and hydraulic systems. The course also deals with the mechanical vibrations of such systems and the ways of its isolation. Vibrations measuring instruments have been included in the course. Experimental work is also included.

Teaching Method

- Lectures
- Discussion
- Laboratory Experiments

Expected Learning Outcomes:

CLO-1. Outline the analysis of mechanical systems
CLO-2. Define mechanical systems' response
CLO-3. Apply the principles of vibrations of mechanical systems
CLO-4. Measure the variables related to vibrations
CLO-5. Develop various mechanical system models
CLO-6. Demonstrate the ways of vibrations isolation

Course Contents:

Unit I:	Welcome, Registration & Introduction
Unit II:	Introduction to dynamic systems, Modeling of mechanical systems
Unit III:	Methods of solving differential equations & Laplace transformations
Unit IV:	State Space Representation Transfer Function development of mechanical systems
Unit V:	Introduction to Vibrations of single degree of freedom SDOF systems + Free Un-damped/Damped Vibrations Analysis
Unit VI:	Forced Vibrations for Damped/Un-damped SDOF systems + Frequency Response Transfer Function – Bode Plots
Unit VII:	Two-Degree of Freedom systems
Unit VIII:	Vibrations of multi degree of freedom systems

Unit IX:	Introduction to Continuous Systems
Unit X:	Vibration Absorption and Isolation

Text Book (s):

- Ira Cochin,Harold J Plass, "Analysis and Design of dynamic System".Publisher: Harper & Row, Edition:1990.
- Singiresu S. Rao, "Mechanical Vibrations". Publisher: Pearson, 4th Edition
- Leonard Meirovitch "Fundamentals of Vibrations "August 2000

Reference Book (s):

- K. Ogata,"System Dynamics", Pearson Prentice Hall, 4th Edition.
- Thomson, W.T. "Theory of Vibration with Applications", Prentice hall, 5th Edition

Mode of Evaluation:

- Online exam, Assignments and Quizzes ……(10%)
- Midterm- 1……(15%)
- Midterm- 2……(15%)
- Practical exam……(10%)
- Final exam……(50%)

Course title	Engineering Economy	**Coordinator**			
Course code	311-INE-2	**Credits Hrs**	**2**	**Contact Hrs**	3
Prerequisites	NIL	**Level/Year**		8/4	

Course Objective

- Demonstrate the Evaluation of alternatives.
- Recognize and conduct retention analysis
- Perform Break even analysis.

Teaching Method

- Lectures, Class discussion,
- Visual presentation, Tutorial
- (video + practical)

Expected Learning Outcomes:

CLO-1. Understand modern Depreciation methods
CLO-2. Understand inflation
CLO-3. Define application to prices
CLO-4. Describe replacement

Course Contents:

Fundamentals of engineering economy. Time value of money. Evaluation of alternatives. Replacement and retention analysis. Break even analysis. Depreciation methods. Basics of inflation.

Unit I:	Foundations of Engineering Economy
Unit II:	How Time and Interest Affect Money
Unit III:	Nominal and Effective Interest Rate.
Unit IV:	Present Worth Analysis
Unit V:	Annual Worth Analysis
Unit VI:	ROR Analysis

Unit VII:	Benefit/Cost Analysis
Unit VIII:	Breakeven and Payback Analysis
Unit IX:	Replacement Decisions
Unit X:	Inflation Impacts
Unit XII:	Cost Estimation
Unit XIII:	Depreciation

Text Book (s):

- Blank, Leland T. and Tarquin, Anthony J., Basics of Engineering Economy, 1ST Ed., McGraw-Hill, 2008, ISBN 9780071287623.

Reference Book (s):

- William G. Sullivan. Elin M. Wicks and James Luxhoj "Engineering Economy" 13th ed., Prentice Hall, 2005.
- White, Agee, and Case, "Principles of Engineering Economic Analysis", 4th Ed. 2001.

Mode of Evaluation:

- Home work and group discussion……(10%)
- Midterm- 1……(20%)
- Midterm- 2……(20%)
- Final exam……(50%)

Course title	Knowledge Management	**Coordinator**			
Course code	321-GE-2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites	NIL	**Level/Year**		8/4	

Course Objective

- The main objectives are to analyze the role of knowledge management in attainment of financial objectives, quality and process improvement, and innovation; to apply knowledge management models and technologies to business situations; to use a knowledge management system for an organization and to create a knowledge management plan to leverage opportunities to create, capture, represent and share knowledge within an organization.

Teaching Method

- Classroom lectures
- Interacting through E-learning.
- large-and small-group discussion

Expected Learning Outcomes:

CLO-1. Describe knowledge about Formulation of a framework for thinking about knowledge-intensive organizations and describe and work with intangibles.
CLO-2. Apply complex theories and practice of knowledge and intellectual capital management to a wide range of scenarios
CLO-3. Summarize the aspects of industrial era management that may be inappropriate for knowledge-intensive organizations and provide alternatives
CLO-4. Appraise knowledge using modern tools
CLO-5. Judge the use of knowledge management in life-long learning
CLO-6. Appraise knowledge with multidisciplinary teams.
CLO-7. Evaluate the action plans for knowledge-intensive organizations.

Course Contents:

Unit I:	KM Models, Knowledge Capture and Codification, Knowledge sharing and Communities of Practice
Unit II:	Value of Knowledge Management, Role of Organizational Cultures, Value of Knowledge Management, Organizational Learning and Memory
Unit III:	Technologies for Knowledge Management, Innovation and leadership, Life cycles for knowledge management systems,

	Knowledge engineering, Knowledge acquisition,
Unit IV:	Knowledge modelling, Decision support systems.
Unit V:	

Text Book (s):

- Jashopara A (2011), Knowledge Management: An integrated approach, 2ed, Prentice Hall ISBN 978-0-273-72685-2

Reference Book (s):

- Kimiz Dalkir (2011), Knowledge Management in Theory and Practice, Second Edition, ISBN: 9780262015080

Mode of Evaluation:

- Case Studies……(20%)
- Midterm- 1……(15%)
- Midterm- 2……(15%)
- Final exam……(50%)

Course title	Design Thinking	**Coordinator**			
Course code	322-GE-2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites	NIL	**Level/Year**		8/4	

Course Objective

The goal of this course is to provide the background necessary to understand the entrepreneurial approach to business and the tools required to function effectively in the competitive entrepreneurial environment. At the end of this course, the students should be able to:

- Explain and analysis the entrepreneurial process from the generation of creative ideas to exploring feasibility to creation of an enterprise for implementation of the ideas.
- Experience the dynamics of participating on a business team and the power inherent in a team relative to individual effort.
- Create and present a business plan for a technology idea.
- Provide the background, tools, and life skills to participate in the entrepreneurial process within a large company, in a new venture, or as an investor.

Teaching Method

- **C**lassroom lectures
- Interacting through E-learning.
- large-and small-group discussion

Expected Learning Outcomes:

CLO-1. an ability to apply knowledge of mathematics, science, and engineering
CLO-2. an ability to design and conduct experiments, as well as to analyze and interpret data
CLO-3. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
CLO-4. an ability to identify, formulate, and solve engineering problems
CLO-5. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
CLO-6. a recognition of the need for, and an ability to engage in life-long learning
CLO-7. a knowledge of contemporary issues
CLO-8. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Contents:

Unit I:	KM Models, Knowledge Capture and Codification, Knowledge sharing and Communities of Practice
Unit II:	Value of Knowledge Management, Role of Organizational Cultures, Value of Knowledge Management, Organizational Learning and

	Memory
Unit III:	Technologies for Knowledge Management, Innovation and leadership, Life cycles for knowledge management systems, Knowledge engineering, Knowledge acquisition,
Unit IV:	Knowledge modelling, Decision support systems.
Unit V:	

Text Book (s):

- Fogler, H. Scott., and Steven E. LeBlanc. Strategies for creative problem solving. Prentice Hall, 2014.
- Field, B. W. Introduction to engineering design. Monash Melbourne, Dept. of Mechanical Engineering, 2006.

Reference Book (s):

- Dally, James W. Introduction to engineering design: book 9, 4th edition. College House Enterprises, 2017.
- Eide, Arvid R. Introduction to engineering design & problem solving. McGraw-Hill, 2002.
- Bertoline, Gary R., et al. Introduction to engineering design. McGraw Hill Learning Solutions, 2008.

Mode of Evaluation:

- Case Studies……(20%)
- Midterm- 1……(15%)
- Midterm- 2……(15%)
- Final exam……(50%)

Course title	System Dynamic	**Coordinator**			
Course code	323-GE-2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites	329-STAT-2	**Level/Year**		8/4	

Course Objective

The overall aim of this course is to apply the system dynamics approach to model and simulate real world processes/systems in both the public and private sectors. Emphasis is on designing simulation models to explain and improve the problematic dynamic behavior. Students learn to use the system dynamics modelling process: define the dynamics of problems, develop hypotheses for problematic dynamic behavior, analyze and validate computer simulation models, and design policies to improve systemic behavior.

Teaching Method

- Lectures & E Learning classes
- Dialogues and Discussion
- Self-Learning

Expected Learning Outcomes:

CLO-1. An ability to apply knowledge of mathematics, science, and engineering
CLO-2. An ability to design and conduct experiments, as well as to analyze and interpret data
CLO-3. An ability to function on multidisciplinary teams
CLO-4. An ability to identify, formulate, and solve engineering problems
CLO-5. An understanding of professional and ethical responsibility
CLO-6. A recognition of the need for, and an ability to engage in life-long learning
CLO-7. A knowledge of contemporary issues
CLO-8. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Contents:

Unit I:	Systems thinking
Unit II:	Causal loop diagrams, Dynamics of stocks, flows, growth
Unit III:	Modeling delays, Model validation and decision making
Unit IV:	Modeling Human Behavior and nonlinear relationships

Unit V:	Modeling Supply Chains
Unit VI:	Timing & Integration, Control Theory
Unit VII:	Applications & Cases

Text Book (s):

- Sterman, John D. Business dynamics: systems thinking and modeling for a complex world. Irwin, 2014.
- Forrester, jay W. Industrial dynamics. Mansfield Centre, Conn. Martino Publ. 2013
- Kelton, W. David, et al. Simulation with Arena. Mc Graw-Hill, 2015.

Reference Book (s):

- Senge, Peter M. The fifth discipline: the art and practice of the learning organization. Doubleday, 1990.
- Richardson, George P., and Alexander L. Pugh. Introduction to system dynamics modeling with DYNAMO. Productivity Press, 1992.
- Wolstenholme, Eric F., and Jay W. Forrester. System enquiry: a system dynamics approach. John Wiley and Sons, 1994

Mode of Evaluation:

- Mid-Term Test-1 …… (15 %)
- Mid-Term Test-2 …… (15 %)
- Group Discussion…… (05 %)
- Quizzes and Assignment…… (05 %)
- Final Exam. …… (50 %)

Course Syllabi and Description
for
Fifth Year

	Level-9	
50	511-ME-3	Control Systems
51	512-ME-2	Senior Design Project-1
52	511-GE-2	Engineering Entrepreneurship
53		Elective -2
54		Elective -3
55	xxx	Free course-2

	Level-10	
56	521-ME-2	Senior Design Project-2
57	411-INE-2	Engineering Management
58		Elective-4
59		Elective-5

Course title	Control Systems	**Coordinator**			
Course code	511-ME-3	**Credits Hrs**	**3**	**Contact Hrs**	4
Prerequisites	424-ME-3	**Level/Year**		9/5	

Course Objective

Upon completion of this course , it is expected that the students will be able to:

- Understand the analysis and modeling of physical system dynamics responses.
- Develop, manipulate and interpret system transfer function block diagrams.
- Analyze the feedback control systems, including determining stability, transient performance, and steady-state error. The student should also have a mastery of the relationship between closed loop poles and system performance.
- Design control system using proportional, derivative, and integral control.
- Use of the root locus design methodology. The student should be able to use root locus to design proportional control, add zeros to influence transient behavior, and apply root locus to selecting general control parameters.
- Use Frequency response techniques including Bode plots, the Nichol's chart, the phase margin, and the gain margin.
- Design and case studies Control system: P, PD, PID, lead compensator, and lag compensator design using time and frequency domain techniques.
- Apply of control system implementation using computer simulation by MATLAB and Simulink.

Teaching Method

- Lectures,
- Discussion,
- Laboratory Experiments

Expected Learning Outcomes:

CLO-1. Recognize the basic goals of control systems in terms of transient and steady state response behavior
CLO-2. State the relationship between transient and steady-state time response behavior in connection with the transfer function description
CLO-3. Analyze the control process using mathematical rules
CLO-4. Differentiate between types and accuracy of the control strategy that is used in the control process
CLO-5. Demonstrate various control strategies
CLO-6. Question the phenomena during the process of control
CLO-7. Assess the ability to deal with the hardware and control systems components
CLO-8. Evaluate simulation results of dynamic systems

Course Contents:	
Unit I:	Theory and modeling of linear mechanical systems: lumped parameter models of mechanical, electrical systems
Unit II:	Electromechanical systems; interconnection laws;
Unit III:	Actuators and sensors. Linear systems theory: linear algebra;
Unit IV:	Laplace transforms, Transfer Functions
Unit V:	Block diagrams
Unit VI:	Time response, poles and zeros
Unit VII:	Time response solutions via analytical and numerical techniques
Unit VIII:	Stability and Feedback systems control
Unit IX:	Stability of control systems: Routh–Hurwitz criterion
Unit X:	Controllers
Unit XI:	PID compensation.
Unit XII:	PID compensation; steady-state characteristics.
Unit XIII:	Root-locus and Frequency domain method.
Unit XIV:	Bode plots and Nyquist stability.

Text Book (s):

- Norman S. Nise, "Control Systems Engineering", 6th Edition, 2011.

Reference Book (s):

- Automatic Control Systems, Benjamin Kuo
- Linear Algebra and Its Applications, by Gilbert Strang
- Modern Control Systems, by Dorf & Bishop

Mode of Evaluation:

- Assignments and Quizzes……..(10%)
- Midterm- 1 ……..(15%)
- Midterm- 2 ……..(15%)
- Final practical exam ……..(10%)
- Final exam……..(50%)

Course title	Senior Design Project-1	**Coordinator**			
Course code	512-ME-2	**Credits Hrs**	**2**	**Contact Hrs**	
Prerequisites	Passing 125 hours of credit hours	**Level/Year**		9/5	

Course Objective

The graduation project is a project chosen by the student in the final year (in the ninth level). Students start to collect theoretical and practical information about the subject of the project and design and construct experimental set up or develop a mathematical model. Finally, the students prepare first phase presentation.

Teaching Method

- Lectures
- Main library
- Online learning
- Discussions
- Self-learning
- Tutorials
- Co-Learning

Expected Learning Outcomes:

CLO-1. State the basic science and mathematics, rules and steps of design, planning, and implementation of the engineering projects
CLO-2. Relate societal, health, safety, legal, management, sustainability and cultural issues involved in executing the engineering project
CLO-3. Identifying the problem and formulating the problem to arrive at the solution of the engineering problem
CLO-4. Distributing the project work among the team and contributing individually
CLO-5. Judge and understand contemporary issues involved in the project
CLO-6. Research on the internet and digital library to get more information and employ the blackboard facility to deal with each other's and with the instructors

Course Contents:

Unit I:	Collecting of required information (theoretical and experimental) for the project
Unit II:	Discussions within team and supervisors and expert committees
Unit III:	Conducting pilot experiments, implementing the mathematical and/or the computational models and doing sample simulations

Unit IV:	Understanding the feasibility and procuring/outsourcing required items required for the project
Unit V:	Presenting the first phase of the project in front of an examination committee.

Text Book (s):

- It is indicated according to the specialization field, which will be chosen for the project.

Reference Book (s):

- It is indicated according to the specialization field, which will be chosen for the project.

Mode of Evaluation:

- Group Discussion, examination, speech ……(10%)
- Internal presentations ……(40%)
- Interim report ……(10%)
- First phase presentation ……(40%)

Course title	Engineering Entrepreneurship	**Coordinator**			
Course code	511-GE-2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites	NIL	**Level/Year**		9/5	

Course Objective

The goal of this course is to provide the background necessary to understand the entrepreneurial approach to business and the tools required to function effectively in the competitive entrepreneurial environment. At the end of this course, the students should be able to:

- Explain and analysis the entrepreneurial process from the generation of creative ideas to exploring feasibility to creation of an enterprise for implementation of the ideas.
- Experience the dynamics of participating on a business team and the power inherent in a team relative to individual effort.
- Create and present a business plan for a technology idea.
- Provide the background, tools, and life skills to participate in the entrepreneurial process within a large company, in a new venture, or as an investor.

Teaching Method

- Classroom lectures l
- large-and small-group discussion
- Interacting through E-learning.

Expected Learning Outcomes:

CLO-1. An ability to function on multidisciplinary teams
CLO-2. An understanding of professional and ethical responsibility
CLO-3. A knowledge of contemporary issues
CLO-4. An ability to communicate effectively (written)
CLO-5. An ability to communicate effectively (oral)

Course Contents:

Unit I:	The course is firmly presented in a "real-world" format, including students taking the roles of company founders and investors, creating a vision and execution plan for their company, and raising funds. The course is delivered along the following outline: 1.Introduction to Entrepreneurship

	1.1Introduction to Technology Entrepreneurship and Technology Ventures, 1.2Engineers as Entrepreneurs, 1.3Mindset of the Entrepreneurial Leader, 1.4Creating and Selling the Entrepreneurial Value Proposition.
Unit II:	2.Idea Generation and Feasibility Analysis 2.1 Entrepreneurial Idea Generation and Feasibility Analysis, 2.2 Technology Commercialization Potential, 2.3 Assessing and Presenting the Opportunity.
Unit III:	3.Business Planning and Execution 3.1 Business Structuring and Strategy, 3.2Business planning and the Business Plan, 3.3 Financial Analysis and Projections; 3.4Market and Competitive Analysis, 3.5 Presentation of the Opportunity, 3.6 Intellectual Property Strategies for Technology Companies; 3.7 Investment and Financial Strategies, 3.8 Venture Growth and Value Harvesting.
Unit IV:	
Unit V:	

Text Book (s):

- The Art of the Start: The time-tested, battle-hardened guide for anyone starting anything, Kawasaki, Guy; ISBN: 1591840562, Portfolio – a member of Penguin Group; 2004.

Reference Book (s):

- Technology Ventures: From Idea to Enterprise, Dorf, Richard, Byers, Thomas, and Nelson, Andrew; ISBN 978-0073380186; 3rd Edition, 2009.

Mode of Evaluation:

- Assignments and Quizzes……(10%)
- Group discussions and studies……(10%)
- Midterm- 1 ……(15%)
- Midterm- 2 ……(15%)
- Final exam……(50%)

Course title	Internal Combustion Engine	**Coordinator**			
Course code	531-ME-3	**Credits Hrs**	3	**Contact Hrs**	4
Prerequisites	413-ME-3	**Level/Year**		9/5	

Course Objective

Internal combustion engines course aims to provide students with the skills needed to work effectively in industrial development projects and innovative product development. The course aims to provide the basic knowledge about internal combustion engines, principle of operation, working cycle, the constructional design and functions of the different components. It gives the practical experience and skills to diagnose, repair, adjust and maintain engine mechanical components and systems.

Teaching Method

Lectures, Discussion with students, Presentation, solving problems, Homework assignments, individual reports, team work to prepare reports, Collaborative learning, discussion group, Case study, tables , graphs

Expected Learning Outcomes:

CLO-1. Define the basic concepts of internal combustion engines and Distinguish between different engine types, Recognize combustion process in I.C.E, engine knock, diesel knock and factors affecting their occurrence
CLO-2. calculate the composition of exhaust gas emissions for different fuels, Differentiate between spark ignition engine and compression ignition engine, Estimate various engine performance parameters for SI and CI engine
CLO-3. Show the work independently and as a part of a team
CLO-4. Operate the computer and e-mail messaging, research the internet search to get the data related to ICE

Course Contents:

Unit I:	Introduction, Engine Types
Unit II:	Engine Design and Operating Parameters
Unit III:	Thermal cycles

Unit IV:	Fuel and combustion
Unit V:	Emission control devices Phenomena
Unit VI:	I.C.E. fuel systems, carburetion, fuel injection
Unit VII:	Ignition systems
Unit VIII:	Engine performance
Unit IX:	Supercharging and its effect on engine performance

Text Book (s):

- Heywood, J.B, "Internal Combustion Engine Fundamentals", McGraw-Hill, latest edition.
- Willard W. Pukabek, "Engineering Fundamentals of the Internal Combustion Engines", Prentice Hall, 2 ed., 2003.

Reference Book (s):

- Richard Stone, "Introduction to Internal Combustion Engines", Paperback - November 15, 1999
- Internal Combustion Engine in Theory and Practice: Vol. 2 - 2nd Edition, Thermodynamics of Combustion Engines
- Turns, S. R., An introduction to Combustion: concepts and applications, McGraw-Hill Inc., New York, USA, 1996.

Mode of Evaluation:

- Blackboard (E-Learning) activities 10%
- First Mid-Term Exams (Theoretical and Practical).....15%
- Second Mid-Term Exams (Theoretical and Practical).....15%
- Laboratory/tutorial Work 10%
- Term Final Exam.....50%

Course title	Energy Conversion	**Coordinator**			
Course code	532-ME-3	**Credits Hrs**	3	**Contact Hrs**	3
Prerequisites	422-ME-3	**Level/Year**		9/5	

Course Objective

Upon completing of this course, it is expected that students will be able to:

This course provides students with an understanding of the thermo-physical principles that govern energy conservation processes of different types, and will introduce them to modern computational methods of modeling the performance of energy conversion processes, devices and systems. This course is the capstone experience for ME students, synthesizing thermodynamics, fluid dynamics, heat transfer, and computational analysis tools to facilitate engineering design analysis. This course will provide a foundation for design analysis of energy conversion and systems encountered in a variety of applications

By the end of this course the student will able to:

- Memorize principles of thermodynamics, heat transfer and fluid dynamics that affect performance of a wide variety of energy conversion devices and systems.
- List the advantages and limitations of a variety of energy conversion systems
- compare competing energy conversion technologies on an economic and efficiency basis;
- construct multidisciplinary computational performance models of a variety of energy conversion system
- Demonstrate discussions with colleagues and with teachers
- Choose ideas and share with others
- assess the validity of energy conversion claims made in popular media
- Interpret acceptable technical report

Teaching Method

- Class lectures,
- Student presentation,
- Reports and Case studies
- Problem assignments presentation
- Group discussion
- Problem assignments presentation

Expected Learning Outcomes:

CLO-1. Memorize principles of thermodynamics, heat transfer and fluid dynamics that affect performance of a wide variety of energy conversion devices and systems CLO-2. List the advantages and limitations of a variety of energy conversion systems CLO-3. compare competing energy conversion technologies on an economic and efficiency basis CLO-4. construct multidisciplinary computational performance models of a variety of energy conversion system CLO-5. Demonstrate discussions with colleagues and with teachers CLO-6. Choose ideas and share with others CLO-7. assess the validity of energy conversion claims made in popular media CLO-8. Interpret acceptable technical report	
Course Contents:	
Unit I: Energy, Growth Rate & Energy Economics	· energy, energy classification, units · energy conversion, conversion efficiency · energy information and perspectives · growth rates, peak oil
Unit II: Thermal-to-Mechanical Conversion	· early engines & efficiency · Thermodynamics & power cycles & efficiency · Rankine Cycle · Brayton Cycle
Unit III: Chemical-to-Thermal Conversion	· fuels: coal, petroleum, gas · principles of combustion
Unit IV: Nuclear-to-Thermal Conversion	· principles of nuclear energy · pressurized water reactors · boiling water reactors · boiling water, graphite-moderated reactors · Gen-IV reactors
Unit V: Electromagnetic-to-Electrical Conversion	· principles of photovoltaic
Unit VI: Mechanical-to-Mechanical Conversion	· principles of wind energy
Unit VII: Chemical-to-Electrical	· principles of fuel cells

Conversion	
Unit VIII: Introduction to Energy Storage	· hydrogen · flow batteries · compressed gas, flywheels

Text Book (s):

- Fundamentals of Nuclear Science and Engineering, 2nd ed., J. K. Shultis and R. E. Faw, CRC Press, ISBN978-1-4200-5135-3 (2008).
- Principles of Energy Conversion, 2nd ed., A. W. Culp, Jr., McGraw-Hill, ISBN 0-07 014892-9 (1991).
- Power Plant Technology, M. M. El-Wakil, McGraw-Hill Book Company, ISBN 0-07-019288-X (1984) any recent Engineering Thermodynamics textbook
- Energy Systems Engineering - Evaluation and Implementation, F. M. Vanek & L. D. Albright, McGraw-Hill, Inc., ISBN 978-0-07-149593-6 (2008).
- Solar Engineering of Thermal Processes, 3rd ed., J. A. Duffie and W. A. Beckman, John Wiley & Sons(2006).

Reference Book (s):

- Energy Conversion, D. Yogi Gaswami & F. Kreith, ed., CRC Press, ISBN 978-1-4200-4431-7 (2008).
- Synthetic Fuels, R. F. Probstein and R. E. Hicks, Dover Publications, Inc., ISBN 0-486-44977-7 (2006).

Mode of Evaluation:

- Blackboard (E-Learning) activities ……20%
- First Mid-Term Exams (Theoretical and Practical)……..15%
- Second Mid-Term Exams (Theoretical and Practical)……15%
- Final Exam……50%

Course title	Power Plants	**Coordinator**			
Course code	533-ME-3	**Credits Hrs**	3	**Contact Hrs**	4
Prerequisites	413-ME-3 423- ME-3	**Level/Year**		9/5	

Course Objective

The course aims to provide the student with the basic concepts required to understanding and solving the power plants and desalination problems applied on engineering. Defining the main principles of theoretical and practical information for different power plants. Acquiring some skills of designing steam power plants, gas turbine power plants, and combined cycle power plant.

Teaching Method

Lectures, Discussion and dialogue, Self-learning, E-learning, Cooperative learning, Training exercises, Discussion in small groups, Solve problems, Small group work, Research activities, Interactive E-learning, Solving and discuss problems in groups, Teaching using computer applications, field visits

Expected Learning Outcomes:

CLO-1. Define the main principles Steam Power plants, Identify the Steam Condensers and Cooling Towers
CLO-2. Recognize the combined steam/gas power plants, Record the Economy of Power Plant
CLO-3. Evaluate energy balance and efficiency of a Steam Generator, Turbines, and Condenser
CLO-4. Discuss the various technological applications of desalination plants and selecting the appropriate desalination technology
CLO-5. Compare between the different types of power plants and differentiate the most suitable to provide the energy and the least polluted the environment
CLO-6. Show the Work independently and as part of a team
CLO-7. Interpret Technical reports in a team work

Course Contents:

Unit I:	Introduction: Types of Power Stations.
Unit II:	Steam cycle with Reheat and Regenerative Feed water heaters.
Unit III:	Steam Generators (Economizer - Evaporator - Superheater - Air preheater).
Unit IV:	Turbines (Velocity diagram of single and two stages impulse and reaction turbines - Blade efficiency, power, and velocity).

Unit V:	Steam Condensers and Cooling Towers (Types – Thermal Design-Parameters affecting on Performance).
Unit VI:	Gas Turbines (Thermal performance of modified cycle with reheat and inter-cooling).
Unit VII:	Power Plant Economy and Energy Cost Estimation.

Text Book (s):

- Dipak Sarkar "Thermal Power Plant Design and Operation", Elsevier, August 2015.
- El-Wakil, M. M., "Power Plant Technology", Mc Graw-Hill, New York, 2002
-

Reference Book (s):

- Raja, A.K., "Power Plant Engineering New age International ltd", 2006.
- Gill, A.B., "Power Plant Performance", Butterworth–Heinemann, latest edition.
- Skrrotiziki, B.G.A & Vopat, W.A., "Power Station Engineering and Economy", Mc-Graw Hill, New York, latest edition.
- Howe, E.D., "Fundamental of Water Desalination", M. Dekker Publisher, latest edition

Mode of Evaluation:

- Quizzes and Attendance……10%
- Sheets and reports ……10%
- Midterm Exam-1……15%
- Midterm Exam -2……15%
- Final Exam……50%

Course title	Computer Aided Manufacturing	**Coordinator**			
Course code	534-ME-3	**Credits Hrs**	3	**Contact Hrs**	4
Prerequisites	311-ME-3	**Level/Year**		9/5	

Course Objective

- Recognize an engineering drawing of a complex part; and how you will be able to correctly program the part.
- Train on CNC M/C (turning – Milling).
- Understand the various elements of the robots system.
- Identify the different type of robots and appreciate the differences between them.
- Understand the various types of robot geometry available.

Teaching Method

Face to Face, Virtual Classes, Discussion boards, Self-learning, Groups, CNC Discussion boards, Weekly groups, Exercises in G codes and M codes, Discussion Boards on eLearning, Writing reports, Solve and discuss problems in groups, Teaching using computer applications

Expected Learning Outcomes:

CLO-1. Write part program by recognizing engineering drawing of a complex part, Define various elements of the robots system
CLO-2. Use CNC M/C Turning-Milling, Differentiate various type of robots, Reconstruct various types of robot geometry
CLO-3. Demonstrate the CNC Turning and Milling independently and as part of a team
CLO-4. Illustrate part programming and write a technical report on, Assess the parts using simulation programs

Course Contents:

Unit I:	Introduction to robot
Unit II:	Robot geometries
Unit III:	Robot power supplies
Unit IV:	Robot end effectors
Unit V:	Introduction to CNC

Unit VI:	CNC Milling
Unit VII:	CNC Turning
Unit VIII:	CNC Drilling

Text Book (s):

- Mikell P. Groover, "Automation,Production Systems, and Computer Integrated Manufacturing" 2014 5th Edition

Reference Book (s):

- Various online additional resources are available in each chapter

Mode of Evaluation:

- Quizzes ……5%
- Assignment and reports ……5%
- Discussion boards ……5%
- Practical Exercises……5%
- Mid Term Exam. 1 ……15%
- Mid Term Exam. 2……15%
- Final Exam……50%

Course title	Mechanical Behavior of Materials	**Coordinator**			
Course code	535-ME-3	**Credits Hrs**	3	**Contact Hrs**	4
Prerequisites	211-ME-3	**Level/Year**		9/5	

Course Objective

The main aim of this course is to provide knowledge on the application of scientific principles to real-life situations, by using appropriate mechanical tests. The major objectives include:

- To gain an understanding of the dislocation theory and plastic deformation in order to explain strengthening mechanisms in different materials, materials applications in elevated temperature, fundamental of fracture mechanics, microstructure aspects of fracture toughness, transition temperature, environment-assisted cracking, and fatigue crack propagation.
- To acquire practical experience in the use of mechanical testing equipment and use of scanning electron microscopy for failure analysis.
- To cultivate interest in understanding the properties of materials required for various real-life applications.

Teaching Method

- Class room teaching,
- Laboratory classes
- Tutorials
- Quizzes and assignments through blackboard

Expected Learning Outcomes:

CLO-1. Relate the principles of mathematics, chemistry, and physics in the mechanical behavior of materials and structural design
CLO-2. Calculate stress and strain in elastic and plastic deformation
CLO-3. Explain various strengthening mechanisms and its applications, Describe the effect of notches and environments on the material fracture
CLO-4. Explain various mechanical test to characterize engineering materials, Appraise ASTM standards in Testing of materials
CLO-5. Demonstrate the application of UTM, Impact Testing, Creep testing, and Fatigue Testing in characterization of materials, Analyze fracture behavior using Scanning Electron Microscope
CLO-6. Research on internet and digital library to get on engineering materials and their behavior and employ the blackboard facility to deal with each other's and with the instructors

CLO-7. Illustrate various mechanical testing and its procedures	
Course Contents:	
Unit I:	Engineering Materials
Unit II:	Structure and Deformation in Materials
Unit III:	Mechanical Testing: Tension Test and Other Basic Tests
Unit IV:	Stress–Strain Relationships and Behavior
Unit V:	Complex and Principal States of Stress and Strain
Unit VI:	Yielding and Fracture under Combined Stresses
Unit VII:	Fundamental of fracture mechanics, microstructure aspects of fracture toughness, the transition temperature
Unit VIII:	Environment-assisted cracking, Stress corrosion cracking, hydrogen embrittlement
Unit IX:	Fatigue of Materials: Introduction and Stress-Based Approach
Unit X:	Notch Sensitivity and Fatigue crack propagation
Unit XI:	Plastic Deformation Behavior and Models for Material, Microstructural Aspects of Plasticity
Unit XII:	Dislocation, Slips, Strengthening mechanisms
Unit XIII:	Time-Dependent Behavior: Creep and Damping

Text Book (s):

- George Ellwood Dieter, Mechanical Metallurgy, McGraw-Hill, 1988
- Marc Meyers and Krishan Chawla (Eds.), Mechanical Behavior of Materials, Cambridge University Press, 2009
- N. E. Dowling. Mechanical Behavior of Materials, 2nd ed. (Prentice Hall: Upper Saddle River, NJ) 1999
- T. H. Courtney. Mechanical Behavior of Materials, 2nd ed. (McGraw Hill: Boston) 2000

Reference Book (s):

- D. G. Rethwisch and W. D. Callister Jr, Fundamentals of Materials Science and Engineering: An Integrated Approach, John Wiley & Sons, NY, 3rd Edition,

2012.

- Joachim Roesler, Harald Harders, Martin Baeker, Mechanical Behaviour of Engineering Materials: Metals, Ceramics, Polymers, and Composites, Springer Science & Business Media, 2007
- ASM Metals Handbook, Volume 11, Failure Analysis and Prevention, Metals Park, 1986.
- R. W. Hertzberg. Deformation and Fracture Mechanics of Engineering Materials, 4th ed. (J. Wiley & Sons: New York) 1995

Mode of Evaluation:

- Quizzes ……5%
- Midterm-1……15%
- Assignments ……5%
- Midterm-2……15%
- Lab Reports ……10%
- Final Exam……50%

Course title	Composite Materials	**Coordinator**			
Course code	536-ME-3	**Credits Hrs**	3	**Contact Hrs**	3
Prerequisites	211-ME-3	**Level/Year**		9/5	

Course Objective

At the end of this course, the students should be able to:

- Understand the basic knowledge of classifications and applications of composite materials
- Analyze design considerations and laminate structures
- Realize processing and fabrication of composites (metal-matrix, ceramic-matrix, reinforced plastics, honeycomb materials, forming structural shapes
- Understand Stress-strain characteristics of fiber-reinforced materials
- Describe failure theories of fiber-reinforced materials
- Analyze environmentally induced stresses in laminates.

Teaching Method

- Lectures
- Tutorial
- Writing group reports
- Solving problems in group
- Discussions

Expected Learning Outcomes:

CLO-1. Describe basic classifications and applications of composite materials, State Design Considerations and Laminate structures

CLO-2. Summarize Processing and fabrication of composites (metal-matrix, ceramic-matrix, reinforced plastics, honeycomb materials, forming structural shapes, Explain Stress-strain characteristics of fiber-reinforced materials, Apply failure theories of fiber-reinforced materials, Evaluate environmentally induced stresses in laminate

CLO-3. Demonstrate various applications of Composite materials individually and as a group

CLO-4. Assess resources, time and other members in discussion on Composite Materials

Course Contents:

Unit I:	Introduction, Basic Materials
Unit II:	Characteristics of fibers, matrices, interface bonding, adhesives
Unit III:	Microstructure of composites.
Unit IV:	Processing/Manufacturing
Unit V:	Traditional and novel approaches; process fundamentals
Unit VI:	Characterization Composites
Unit VII:	Composite Mechanics Theory
Unit VIII:	Laminate theory; use of a computer based analysis package;
Unit IX:	Micromechanical behavior of a ply, out-of-plane effects
Unit X:	Failure and Strength Design, Failure criteria, Laminate Strength, Stress Concentrations
Unit XI:	Composite Behavior and Applications

Text Book (s):

- Composite Materials, Kar, K.K. (Ed.) (2017)

Reference Book (s):

- Composite Materials, Chung, D.D.L. (2010)
- Composite Materials, Nielsen, L.F. (2005)

Mode of Evaluation:

- Midterm Exam……..30%
- Practical exam (oral and writing exam) , quizzes and reports……..20%
- Final Exam……..50%

Course title	Senior Design Project-2	**Coordinator**			
Course code	521-ME-2	**Credits Hrs**	2	**Contact Hrs**	2
Prerequisites	512-ME-2	**Level/Year**		10/5	

Course Objective

In this project, the student will continue the work done during the senior project-1. He will perform experimental tests or verify mathematical model by using a computer simulation. Finally, the students prepare a final report, present, and defend it in front of the Committee of project evaluation.

Teaching Method

Lectures, Main library, Online learning, Discussions, Self-learning, Tutorials, Co-Learning, Giving classroom presentations of related subject area, Exercising example problems, Finding or creating sample problems of engineering applications (homework and assignments), Making group tutorials, Awareness of time management in completing their tutorials and presentations, Encourage students to help each other, Making most of the course communications through blackboard, Teaching by interacting in office hours, Providing a sample report

Expected Learning Outcomes:

CLO-1. Understanding the basic science and mathematics, rules and steps of design, planning, and implementation of the engineering projects
CLO-2. Explaining the mathematics, science and engineering principles in design and development of models
CLO-3. Design and conduct experiments, as well as operate, document analyze and interpret the output
CLO-4. Design a system, component, or process considering realistic constraints exploring various design strategies and applying engineering/scientific concepts
CLO-5. Identifying, formulating, and finding various solution strategies by using appropriate resources
CLO-6. Recognizing the techniques, skills, and modern engineering tools necessary for completing the project and justifying or evaluating the errors
CLO-7. Self-management and work cordially among the team to execute and complete the project
CLO-8. Research on internet and digital library to get more information and employ the blackboard facility to deal with each other's and with the instructors
CLO-9. Articulate ideas and project outcomes using graphs, tables and diagrams,

present and organize the thesis as per the standard format	
Course Contents:	
Unit I:	Collecting of required information (theoretical and experimental) for the project
Unit II:	Conducting experiments, running and implementing the mathematical and/or the computational models
Unit III:	Analysis of the results and writing a complete final report as per the standard format
Unit IV:	Presenting the project and defending it in front of an examination committee
Text Book (s): • It is indicated according to the specialization field, which will be chosen for the project	
Reference Book (s): • It is indicated according to the specialization field, which will be chosen for the project	
Mode of Evaluation: • Group Discussion, examination, speech……..10% • Second Phase presentation ……..20% • Poster Presentation ……..10% • Final Report ……..20% • Final presentation……..30%	

Course title	Engineering Management	**Coordinator**			
Course code	411-INE-2	**Credits Hrs**	**2**	**Contact Hrs**	3
Prerequisites	NIL	**Level/Year**		8/4	

Course Objective

- Understand the Objectives of Engineering Management
- Importance of Project Management- resource utilization

Teaching Method

- Lectures, Class discussion,
- Visual presentation,
- Tutorial (video + practical)

Expected Learning Outcomes:

CLO-1. To apply project management principles in business situations to optimize time
CLO-2. Identify Project Selection – Teamwork in Project Management
CLO-3. Apply Feasibility study: Types of feasibility in project

Course Contents:

Objectives of Management- Importance of Project Management- Types of Projects Project Management Life Cycle- Project Selection – Feasibility study: Types of feasibility Steps in feasibility study. Project Scope- Estimation of Project cost – Cost of Capital – Project Representation and Preliminary Manipulations - Basic Scheduling Concepts - Resource Levelling – Resource Allocation. Setting a base line- Project management Information System – Indices to monitor progress. Importance of Contracts in projects- Teamwork in Project Management - Attributes of a good project team – Formation of effective teams – stages of team formation. Project evaluation- Project Auditing – Phases of project Audit- Project closure reports Guidelines for closeout reports. Computers, e-markets and their role in Project management- Risk management-Environmental Impact Assessment. Case studies in Project management.

Unit I:	INTRODUCTION TO MANAGEMENT AND PROJECT SELECTION Objectives of Project Management- Importance of Project Management- Types of Projects Project Management Life Cycle- Project Selection – Feasibility study: Types of feasibility Steps in feasibility study.

Unit II:	PROJECT PLANNING AND IMPLEMENTATION Project Scope-Estimation of Project cost – Cost of Capital – Project Representation and Preliminary Manipulations- Basic Scheduling Concepts - Resource Levelling – Resource Allocation
Unit III:	PROJECT MONITORING AND CONTRON Setting a base line- Project management Information System – Indices to monitor progress. Importance of Contracts in projects- Teamwork in Project Management - Attributes of a good project team – Formation of effective teams – stages of team formation
Unit IV:	Project evaluation- Project Auditing – Phases of project Audit-. Project closure reports Guidelines for closeout reports
Unit V:	SPECIAL TOPICS IN PROJECT MANAGEMENT Computers, e-market sand their role in Project management- Risk management- Environmental Impact Assessment. Case studies in Project management

Text Book (s):

- Arun Kanda, "Project Management A Life Cycle Approach", Prentice Hall of India, 2011

Reference Book (s):

- R.Panneerselvam and P.Senthilkumar, "Project Management", Prentice Hall of India, 2009.
- R.B.Khanna, "Project Management", Prentice Hall of India, 2011.

Mode of Evaluation:

- Midterm Exams……..30%
- E-learning activities (quizzes and assignments)……..15%
- Discussions / Attendance / Participation……..05%
- Final Exam……..50%

Course title	Energy Efficient Buildings	**Coordinator**			
Course code	541-ME-3	**Credits Hrs**	3	**Contact Hrs**	3
Prerequisites	413-ME-3	**Level/Year**		10/5	

Course Objective

Upon completing this course, it is expected that the students will be able to:

- Estimate the optimum cost of energy consumption.
- Monitoring the energy consumption.
- Saving energy in refrigeration, air- conditioning and lighting processes.
- Prediction of thermal loads and correct the power factor.
- Estimate the economic loading and operation for generation units.
- Use energy saving policies and use high economic equipment's and improve heat transfer processes.

Teaching Method

Class lectures, Case studies (data collection, internet search, and reports), Problem assignments and student presentation, Reports, Group discussion, Case studies (data collection, internet search, and reports), Problem assignments and student presentation, Reports, Reading assignments, Case studies

Expected Learning Outcomes:

CLO-1. Estimate the optimum cost of energy consumption
CLO-2. Calculate the energy consumption
CLO-3. Predict thermal loads and corrects the power factor
CLO-4. Estimate the economic loading and operation for generation units
CLO-5. Use energy saving policies and use high economic equipment's and improve heat transfer processes
CLO-6. Participate in class discussions with colleagues and with teachers
CLO-7. Work in team to apply energy saving policies
CLO-8. Use of the internet search for course related issues. Verbally present technical report
CLO-9. Write acceptable technical reports on Energy Efficient Buildings

Course Contents:

Unit I:	Day lighting, building topology comparison.

Unit II:	Energy efficient buildings and the role they play in our efforts to address climate change.
Unit III:	The optimum cost of energy consumption and building envelope design.
Unit IV:	The energy consumption in refrigeration, air- conditioning and lighting processes.
Unit V:	Refrigeration systems with working gaseous fluids (The air- standard refrigeration).
Unit VI:	Thermal loads and corrects the power factor.
Unit VII:	The economic loading and operation for generation units.
Unit VIII:	Energy saving policies and use high economic equipment's and improve heat transfer processes
Unit IX:	Chemical reactions (Fuels and combustion and their applications. Theoretical and actual combustion processes. Enthalpy of formation and enthalpy of combustion. Steady-flow and closed reacting systems. First law analysis of reacting systems. Adiabatic flame temperature)
Unit X:	Zero energy homes in hot arid regions, life- cycle considerations and energy efficiency analysis to managing energy demand through equipment selection

Text Book (s):

- Energy Efficient Buildings, ISBN 978 – 51- 2875 – 5, Publisher: In Tech, 2017

Reference Book (s):

- Chen, Olivia , 2008,"Bamboo – Veiled Dormitory by Architecture BRIO", Inhabitat, Retrieved 2009.
- Journal of Energy Comfort in Buildings

Mode of Evaluation:

- Midterm Exam-1……..10%
- Midterm Exam -2……..15%
- Practical exam……10%
- Final Exam……..50%

Course title	Desalination	**Coordinator**			
Course code	542-ME-3	**Credits Hrs**	3	**Contact Hrs**	3
Prerequisites	422-ME-3	**Level/Year**		10/5	

Course Objective

- To provide students with the basic principles required for understanding different desalination methods.
- To provide students with insight into the nature of desalination.
- To help students understanding fouling, scaling, and pre-treatment
- To help students develop the ability to calculate permeates flow rate of RO systems and the total productivity of the other systems.

Teaching Method

- Lecture,
- Laboratory work

Expected Learning Outcomes:

CLO-1. Outline the basics, theory and physical concepts of water treatments.
CLO-2. Recognize the different configurations of thermal desalination Plants.
CLO-3. Analyze the different types of desalination plants.
CLO-4. Differentiate between the different desalination plants.
CLO-5. Design different components of the desalination plants
CLO-6. Cost analysis of cubic meter of desalinated water.
CLO-7. Participate in class discussions with colleagues and with teachers.
CLO-8. Work in team

Course Contents:

Unit I:	Concepts in thermodynamics; Water treatments; Fouling and scaling on tubes; fouling removal
Unit II:	Thermal desalination: Multistage evaporation systems (MES); Multistage Flash systems (MSF); Vapor compression desalination systems(VCD); Solar desalination systems; co-generation power systems.
Unit III:	Reverse osmosis systems: Types of membranes; membrane arrangements; Energy recovery; back washing; membrane fouling; Ultra and nano-filtration.

Unit IV:	Project: Analysis of Desalination Plant

Text Book (s):

- Hisham T. El-Dessouky and Hisham M. Ettouney, Fundamentals of Salt Water Desalination, Elsevier Science B.V., 1st , 2002

Reference Book (s):

- Reverse Osmosis; A Practical Guide for Industrial Users - by Wes Byrne 1st Edition
- Handbook of Desalination and Water Purification – Arshad Hasan Khan and Noam Lior by Elsevier
- Hisham T. El-Dessouky and Hisham M. Ettouney, Fundamentals of Salt Water Desalination, Elsevier Science B.V., 1st , 2002
- Desalination Processes and Multistage Flash Distillation Practice 1986 Khan A.K

Mode of Evaluation:

- Assignments and quizzes 10%
- Two mid-term exams.....30%
- Reports and Term Work.....10%
- Final Exam.....50%

Course title	Refrigeration & Air-Conditioning	**Coordinator**			
Course code	543-ME-3	**Credits Hrs**	3	**Contact Hrs**	4
Prerequisites	413-ME-3	**Level/Year**		10/5	

Course Objective

Upon completing this course, it is expected that the students will be able to:

- Understand the concepts of refrigeration and air-conditioning.
- Understand the principles of refrigeration and air-conditioning.
- Understand refrigeration and air-conditioning systems.
- Maintain refrigeration and air-conditioning components.
- Predict students with refrigeration and air-conditioning thermal loads.
- Develop and enhance the student's mentality.

Teaching Method

- Lecture,
- Lab,
- Discussion,
- Solving problems

Expected Learning Outcomes:

CLO-1. Outline the methods of refrigeration
CLO-2. Describe the single stage and multi-stage vapor compression refrigeration cycles.
CLO-3. Calculate the coefficient of performance of absorption refrigeration cycle
CLO-4. Estimate the coefficient of performance of vapor compression refrigeration cycles.
CLO-5. Calculate the cooling load of summer cycles
CLO-6. Estimate the heating load of winter cycles.

Course Contents:

Unit I:	Introduction to refrigeration methods.
Unit II:	Single and multi-stage refrigeration cycles.
Unit III:	Refrigerants and components of refrigeration cycles.
Unit IV:	Refrigerants and components of refrigeration cycles.

Unit V:	Principles of air-conditioning / Body comfort / Inside and outside design conditions.
Unit VI:	Load estimation / Psychrometric representation for summer and winter.
Unit VII:	Air-conditioning systems

Text Book (s):

- Shan K. Wang and ZalmanLavan,"Air-Conditioning and Refrigeration"
- ASHRAE Handbook: Refrigeration Systems and Applications, American Society of Heating,2006

Reference Book (s):

- Shan K.Wang "Handbook of Air-Conditioning and Refrigeration", 2ndEddition.Mc-Graw --Jeffus,L, "Refrigeration and Air Conditioning :An Introduction to HVAC", Prentice Hall, 4 th ed.,2003.

Mode of Evaluation:

- Quizzes and assignments on blackboard 15%
- Mid-term exams 1.....10%
- Mid-term exams 1.....15%
- Practical exam.....10%
- Final Exam.....50%

Course title	Fundamentals of Heat Treatment	**Coordinator**			
Course code	544-ME -3	**Credits Hrs**	3 hrs	**Contact Hrs**	4hrs
Prerequisites	211- ME -3	**Level/Year**		10/5	

Course Objective

At the end of this course, the students should be able to:

- Discuss the nature of metals and alloys.
- Recite the principles of heat treatment of steels.
- Explain the heat treatment processes for steels.
- Assess the hardenability of metals and alloys.
- Select the quenching media for each heat treatment cycle.
- Explain the chemical heat treatment of steels.
- Explain the proper heat treatment cycle for each metal and alloy.
- Explain the surface hardening treatment for metals and alloys.
- Explain the thermo-mechanical treatment for ferrous and non-ferrous alloys.
- Discuss the different types of heat treatment furnaces used in treating metals and alloys.

Teaching Method

- Lecture,
- Discussion,
- E-learning,
- Self-learning,
- Writing group reports

Expected Learning Outcomes:

CLO-1. Recall the nature of metals and alloys, Recite the principles of heat treatment of steels Explain the heat treatment processes for steels.
CLO-2. Define the hardenability of metals and alloys, Recognize the chemical heat treatment of steels.
CLO-3. Use the quenching media for each heat treatment cycle.
CLO-4. Explain the proper heat treatment cycle for each metal and alloy.
CLO-5. Explain the surface hardening treatment for metals and alloys
CLO-6. Discuss the different types of heat treatment furnaces used in treating metals and alloys.
CLO-7. Explain the thermo-mechanical treatment for ferrous and non-ferrous alloys
CLO-8. Demonstrate independently and as part of a team.

CLO-9. Illustrate resources, time and other members of the group CLO-10. Interpret the experiment results. CLO-11. Evaluate technical reports	
Course Contents:	
Unit I:	Introduction to heat treatment.
Unit II:	Natural of metals and alloys.
Unit III:	Principals of heat treatment of steels.
Unit IV:	Heat treatment processes for steels.
Unit V:	Hardenability and quenching.
Unit VI:	Chemical heat treatment of steels
Unit VII:	Surface hardening
Unit VIII:	Thermo-mechanical treatment
Unit IIX:	Heat treatment furnaces and atmospheres
Text Book (s): • T.V. Raja, C.P. Sharma, and A. Sharma, Heat treatment: principles and techniques, PHI Learning Private, New Delhi, 2011 (or later).	
Reference Book (s): • R.C. Sharma, Principles of heat treatment of steels, new age international (P) Limited, New Delhi, 2003, ISBN: 8122408699. • B. Zakharov, Heat treatment of metals, USSR, 2002	
Mode of Evaluation: • Quizzes and assignments .....20% • Mid-term exams .....30% • Final Exam.....50%	

Course title	Finite Element Analysis in Engineering Design	**Coordinator**			
Course code	545-ME-3	**Credits Hrs**	3	**Contact Hrs**	5
Prerequisites	421-ME-3 & 419-MATH-3	**Level/Year**		10/5	

Course Objective

Upon completing this course, it is expected that students will be able to:

- Summarize the principles of the Finite Element Analysis to design problems and practical applications.
- Provide students with an understanding of the theoretical background of the Finite Element Method;
- Acquire the skills about the application of procedures of the Finite element Analysis.
- Give guidance to its practical application in engineering mechanics.
- Recognize the Collaborative Design and Engineering concepts such as DFM, DAM etc.

Teaching Method

- Lecture,
- Self-learning,
- E. Learning,
- Practical training in workshops

Expected Learning Outcomes:

CLO-1. Outline the philosophy behind principles, design and modeling considerations in using finite element analysis
CLO-2. Describe the general steps used in the finite element analysis to model problems in engineering
CLO-3. Create and design engineering structures using finite element methods.
CLO-4. Predict the safe design limits for engineering structures.
CLO-5. Communicate effectively through a written report the creation of optimized design of engineering structures

Course Contents:

Unit I:	Basic finite element concepts-General finite element solution procedure, Finite element equations using modified Galerkin Approach. Applications: Axial deformation of bars, Axial spring element.

Unit II:	Analysis of trusses-Two dimensional truss element, Stresses, Strains and temperature changes.
Unit III:	Beam bending- Two node beam element, Exact solution for uniform beams subjected to distributed loads using superposition, Calculation of stresses in beams..
Unit IV:	Two dimensional boundary value problems using triangular elements, Triangular element for general 2D BVP, Numerical Examples
Unit V:	Iso-parametric quadrilateral elements-Shape functions for rectangular elements, quadrilateral elements, Numerical integration for quadrilateral elements, Four node quadrilateral element for 2D BVP,
Unit VI:	Axisymmetric elasticity problems-Governing equations for axisymmetric elasticity, Axisymmetric linear triangular element.
Unit VII:	Numerical integration for Quadrilateral elements and Triangular elements

Text Book (s):

- The Finite Element Method: Linear Static and Dynamic Finite Element Analysis, Thomas JR Hughes.
- A First Course in Finite Element Method, Jacob Fish, Ted Belytschko.
- Applied Finite Element Analysis, LJ Segerlind.

Reference Book (s):

- Daryl L. Logan - A First Course in the Finite Element Method

Mode of Evaluation:

- Assignments 10%
- Homework..... .....10%
- Mid-term exam 1..... .....15%
- Mid-term exam 2..... .....10%
- Final Exam.....50%

Course title	Nanotechnology	**Coordinator**			
Course code	546-ME-3	**Credits Hrs**	3 hrs	**Contact Hrs**	3hrs
Prerequisites	211-ME-3	**Level/Year**		10/5	

Course Objective

This course brings together relevant knowledge from the disciplines of physics and chemistry to give engineering students a fundamental understanding of the integrated multidisciplinary nature of Nanotechnology. The major objectives include:

- To gain an understanding of the principles of nanotechnology; characterization of nanostructured materials; and tools and equipment for producing and assembling at the nano-scale.
- To acquire practical experience in the use of equipment used in nanotechnology such as SEM, TEM, AFM.
- To cultivate interest in the research and development of nanotechnology for future advancement of the career.

Teaching Method

- Class room teaching,
- Laboratory classes,
- Tutorials

Expected Learning Outcomes:

CLO-1. Describe the principles of nanotechnology;
CLO-2. Calculate surface energy, chemical potential and analyzing electrostatic stabilization
CLO-3. Explain various production techniques for nano structures and their applications
CLO-4. Identify various Nano materials and differentiate them based on their properties
CLO-5. Demonstrate the application of SEM, AFM in characterization of Nano structures
CLO-6. Research on internet and digital library to get more information in nanotechnology and employ the blackboard facility to deal with each other's and with the instructors

Course Contents:

Unit I:	Emergence and challenges of Nano Technology
Unit II:	Physical Chemistry of solid surfaces
Unit III:	Development and application of Nano particles, nano wires, nano rods and thin films..
Unit IV:	Special Nano materials: carbon fullerenes and nanotubes, micro and mesoporous materials
Unit V:	Nano structures fabricated by Physical Techniques
Unit VI:	Structural and Chemical Characterization and properties of nano materials (Use of XRD, SEM, TEM, AFM)
Unit VII:	Application of Nano materials

Text Book (s):

- Charles P. Poole Jr., Frank J. Owens; Introduction to Nanotechnology, Wiley-Interscience; 1 edition (May 30, 2003)
- Guozhong Cao (Author), Ying Wang (Author); Nanostructures and Nanomaterials: Synthesis, Properties, and Applications (2nd Edition) (World Scientific Series in Nanoscience and Nanotechnology)World Scientific Publishing Company; 2 edition (January 3, 2011)World Scientific Publishing Company

Reference Book (s):

- Mark A. Ratner, Daniel Ratner, Nanotechnology: A Gentle Introduction to the Next Big Idea, Prentice Hall, 2002.
- Gunter Schmid, Nanotechnology: Principles and Fundamentals ,Wiley, 2008.
- Gabor L. Hornyak, H.F. Tibbals, Joydeep Dutta, and John J. Moore, Introduction to Nanoscience and Nanotechnology, CRC Press, 2009.

Mode of Evaluation:

- Quizzes..... .....5%
- Assignments 5%
- Lab Evaluation..... .....10%
- Mid-term exam 1.....15%
- Mid-term exam 2.....15%
- Final Exam.....50%